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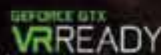


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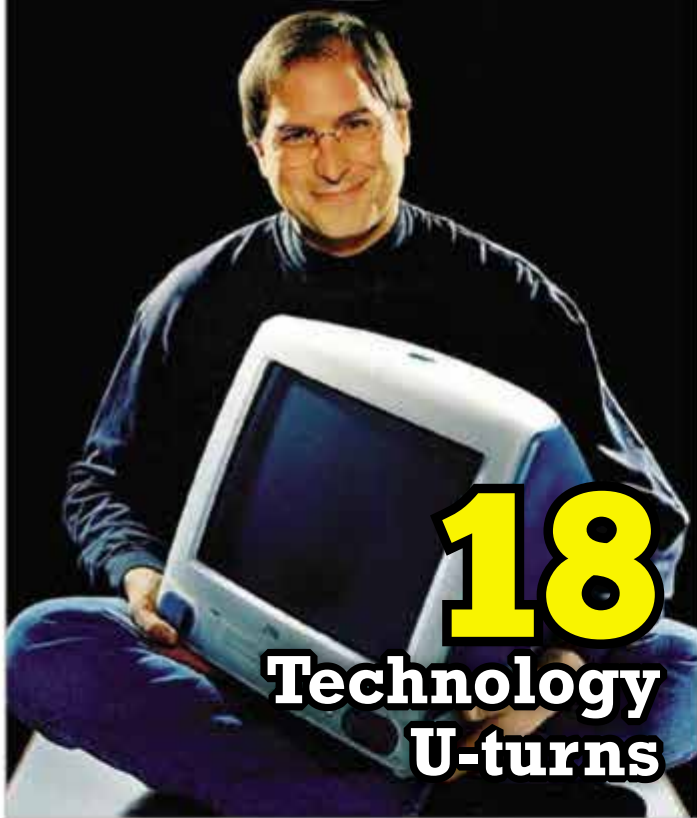
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08 Delete Your Data

Practically every website you visit, whether it is a social network like Facebook or Twitter, or a company like Google or Microsoft, will have a file on you. The reason is simple: if you avail yourself of their free services, they want something in return for their free products. What they take from you, of course, is data. That may not bother you in the slightest, but if it does, what can you do to make sure it's deleted?

18 Technology U-turns

Being indecisive and changing your mind might be infuriating to others, but it's your right. Indeed, you could even change your mind about being indecisive if you wanted to. If you're a major, global technology company, though, your about-turns are played out in the glare of public opinion, and it doesn't generally make you look good. Mark Pickavance tells us more

50 Budget SSDs

Although they're still more expensive and much less capacious as regular hard drives, SSDs are now cheap enough that you can pick up a decent amount of storage for less than £50. In fact, some of them now cost just £30, which is fantastic. We set David Hayward the task of looking at six of these low-price drives and seeing how they measure up

50

Budget SSDs



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58 Dealing With Duplicate Files

Whether you realise it or not, you might have accumulated a large amount of files on your PC that were already on your PC. Some of these duplicated files are needed, but quite a lot of them are just taking up valuable space for no reason. What's the solution? Read our guide this week to find out

64 Bluetooth Headsets

Wireless audio was once restricted to RF and infra-red devices. While Bluetooth has made it so much cheaper and more flexible, not all Bluetooth headsets are created equal, so what should you be looking for and what things should you avoid? We take a look at what you need to consider before making a purchase



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Delete What Websites Know About You

Worried about your privacy and the information websites have on file about you? We take a look at how you can remove the lot

We live in a world of sharing. Most of us post on Facebook, and lots of us tweet our thoughts and intricate moments of our day-to-day lives. We use LinkedIn to detail the intricacies of our CVs, we set up blogs, and we sometimes even reveal our real identities on forums, merging alter egos with real life. We're more open than ever before.

But there is an inherent danger in our actions. Not only are we putting ourselves out there – turning ourselves into minor celebrities in some cases – we are also allowing the websites we use to grab lots of details about us too. Each time we log into a service, we're allowing all sorts of data to be collected and collated. Some sites know us better than some of our closest friends.

You may have spotted stark signs of this, whether it's through adverts on websites that uncannily appear to know the kinds of products you've just been looking at or those emails that keep appearing that seem to have a good handle on what you most enjoy. Companies appear to stretch the boundaries when it comes to trying to get you to prise open your wallet and they do all they can to generate cash from your interests.

In order to do this, services draw on a digital profile that gets added to almost daily in some cases. And because we've been online for so many years, the level of detail is likely to

be vast. Even if you've never visited Facebook, Twitter or any number of social media websites, and even if you've never touched an online survey, you're not immune when it comes to the data grab.

Your searches, the videos you watch, the places you visit, the items you look at and the music you listen to all form part of a big fat file that is just waiting to be exploited. About the only good news is that very little of this information is actually made public. But as comfortable as you are about divulging something as trivial as what you had for dinner or something more contentious as whether you voted to leave or remain in the EU, it's unlikely that you'd want everything collated.

So how do you remove it? Well, before we get on to that, we should briefly look at how you can stop websites from amassing data about you in the first place. This would seem the sensible option: rather than worry about what's out there, you just call a halt to future gatherings. Yet that's easier said than done. To be truly immune to data collection, you'd effectively need to stop using the internet.

Prevention Better Than Cure?

That said, there are some things you can do. Aside from only opening accounts that you know will prove useful in the long-term, you should look carefully at the privacy section of the

about the data.com Home Contact us Help Log In

Account Registration

The next step in registration requires an address in the United States and the final four digits of your Social Security number.

To create an account, enter the required information and click Register.

Email *
Email is required.

Confirm Email *

Password *

Confirm Password *

We would like to stay in touch.
 We use email as a means to communicate to you about your account, tips and hints, news and promotional opportunities. You can change your communication preferences at any time in account settings.

Captcha *
* required field

Log In

terms and conditions of services and be canny when it comes to ticking boxes on sign-ups to ensure you're not inadvertently giving permission for your data to be used by all and sundry.

You should also look at preventing advertisers from tracking where you go and the websites that you visit. A good way to do this is to use a browser extension that stops third-party trackers from collecting data about you. Privacy Badger (www.eff.org/privacybadger) by the Electric Frontier Foundation, for example, makes a note of services that seek to track your browser across many different websites.

When it spots a company following you around, it orders the browser to stop loading that source's content. It'll keep an eye on adverts, embedded images, stylesheets and maps just in case they contain cookies that are looking to track your browsing habits. Unlike other blocking tools, it will only act to bar a specific domain if it finds that it continues to track you after it has been ordered not to. That way, your general web browsing is unaffected.

“ Google collects data across all of its services ”

It's certainly preferable to blocking all cookies – something that is likely to affect your overall web experience. Issuing a block not only puts a stop to third-party cookies but first-party ones as well, and the latter can be useful on the sites that you use most often. They recognise who you are and remember the kinds of things you want to do on any given website, saving lots of time in the process. It's all about striking a balance.

Exterminate, Exterminate

But what about the past and all of the stuff that the web's many websites already know about you? How do you find out what's out there, wipe the slate clean and delete information that you would rather they didn't build up about you? The first thing you need to do is figure out which websites are most likely to have the most data about you. Step forward, Google.

Google collects data across all its services. When you sign up for an account, it grabs your name, email address, password, birthday, gender, phone number and country. It also has its own ad-tracking service, which learns a lot about your online behaviour. Every time you click or tap on an advert, it works out the type of things that interest you the most.

But that's only the half of it. Google keeps tabs on your video viewing, the websites you visit, the things you search for, the emails you send via Gmail, the events you add on Calendar, your images, photos and documents on Drive and details of your device. It logs your IP address and cookie data, and it uses information gleaned from its Chrome web browser, and ChromeOS and Android operating systems.

We know this because Google appears transparent about its actions. Go to privacy.google.com/your-data.html, and you will see it's not shy to admit what it takes from you each day. It seeks to justify what it does by telling you how it helps in autocompleting searches and forms, finding relevant videos and delivering automatic updates to flight info and sports results. That's where the trust comes in, but thankfully, it's something you can control.

A new service called My Activity has been launched by Google, providing a dashboard that lets you view all of the items that have been stored about your use of the web and its various services. By visiting myactivity.google.com/myactivity, you're able to permanently remove data, and you can also tell Google which topics you do and don't want to be associated with your account.

When you view the page, for instance, you will see it kicks off with the heading Today: an indication of the number of recorded items that have been noted since you woke up this morning. Don't be surprised if this is already in the hundreds, since it's likely that you use Google far more than you imagine. To help make sense of it, though, the data is broken down according to

Deleting Your Accounts

Over the years, you've probably set up dozens and dozens of online accounts, many of which have been abandoned or forgotten. If you want to have a spring clean, targeting these is a good start.

The website justdelete.me lists lots of web services, colour coding them to show which ones are easiest to remove and which prove rather more difficult. Begin with the greens, clicking on the information button, if one is available, to see how you go about deleting your accounts and your data.

Then spend a bit more time getting your head around the red, harder ones – so that's Experian, which makes you call or email; Etsy, which retains your email address, and GroupOn, which makes you contact support.

It dismays us to see a good number of black entries: these are said to be impossible to delete, and they include bungee.net, high street furniture chain Dwell, and Evernote.

The site advises you to replace your details on your Dwell account with bogus information, and it bemoans the fact that you can only deactivate Evernote, which means you'll have to manually delete your notes and personal information.

It's worth bookmarking this website and referring to it before you open any account, assessing whether their services are really worth divulging data that they appear hellbent on hanging on to.



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Using My Activity

How to get around the My Activity interface and delete the data you don't want Google to use.

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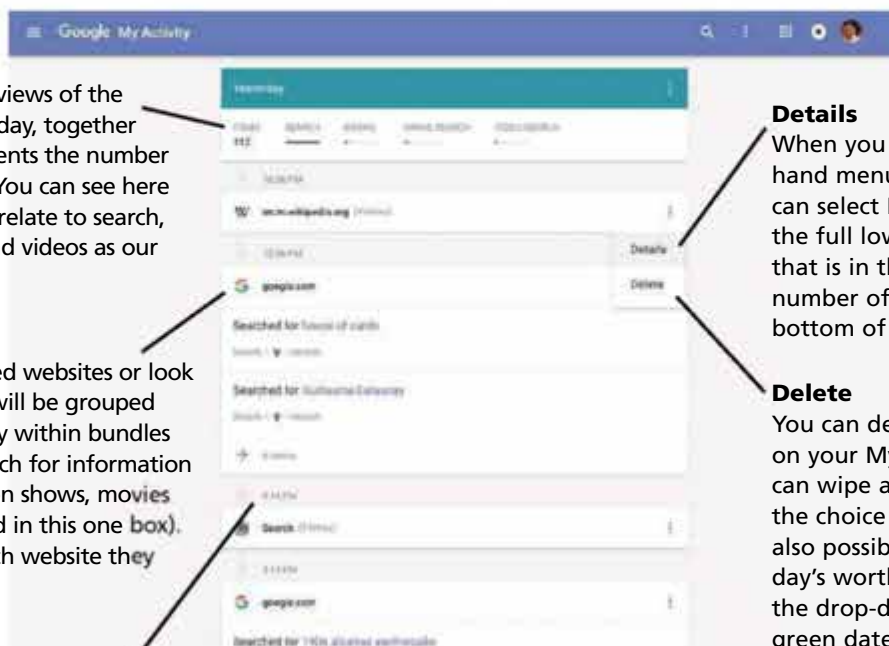
There are at-a-glance views of the categories listed each day, together with a bar that represents the number of items within each. You can see here that our items mainly relate to search, with books, images and videos as our secondary concerns.

Bundles

If you search for related websites or look at similar items, they will be grouped together in My Activity within bundles (which is why our search for information about various television shows, movies and actors is contained in this one box). A heading shows which website they relate to.

Times

Want to know what you were doing at any given time of the day? This will tell you all you need to know. It's the most superfluous feature of My Activity, but you may find it comes in handy for something.



Details

When you click on the right-hand menu within a bundle, you can select Details. It will give you the full lowdown of everything that is in that bundle, the number of which is shown at the bottom of each box.

Delete

You can delete individual entries on your My Activity page, or you can wipe away entire bundles: the choice is entirely yours. It's also possible to delete an entire day's worth of items by selecting the drop-down menu in the green date strips.

category, whether its Search, Books, Video, Image, News and so on. You will therefore see which services you're using the most and to what degree. Everything is time-stamped.

From this point on, you can get down to the serious business of deletion. In the top right-hand corner of every box containing notes of the services you've used is a menu with just two options: Details and Delete. By clicking the latter, you're shown a pop-up box, which tries to briefly explain just why it would prefer you not to delete anything: "your activity can make Google services more useful to you like better commute options in Maps and quicker results in Search". Once you've selected that you're pretty au fait with the whole business, you're then asked to confirm if you want to go ahead and delete the items.

Personalising Adverts

Google also lets you control the information used in showing you advertisements. One of the biggest changes of late has been the company's decision to use behavioural information about you to tailor adverts not just on Google's own services but across the internet and on its search pages. Rather than automatically opt you in, though, you have to make that decision for yourself.

To turn ad personalisation on or off, visit goo.gl/M1NrQO and look for the box that will let Google use your account activity for advertising purposes. This page also lets you turn off data gathering for advertising purposes full stop and while you're at it, you may as well take a look at your Google Profile on this page.

Tapping the edit button in the box lets you take a look at your personal information. Perhaps you'll want to make a slight alteration to your date of birth so you're not giving too much

away, and maybe you'll want to edit what others see about you. You can also turn location sharing on and off and manage your search settings from this page, thereby deleting your whereabouts from the system.

“ It may feel perverse that you'll want to prevent Facebook from keeping data ”

Facing Up To Facebook

But what of other services such as Facebook? It may feel perverse that you'll want to prevent Facebook from keeping data about you (the whole point is that you put information on there for others to see), but it's always worthwhile managing data that's only going to be put to corporate use. Thankfully, Facebook lets you do this.

The first thing you may want to do is download a copy of your Facebook data and see what the company knows. On the desktop version, go to Settings and select and click 'Download a copy of your Facebook data' at the bottom of the general accounts settings. The information will contain lots of information about your profile as well as all your timeline information, posts, messages and photos.

Crucially, though, it will show the adverts you have clicked on and the IP addresses logged when you visit. You'll see when your account was reactivated, deactivated, disabled or deleted, and any

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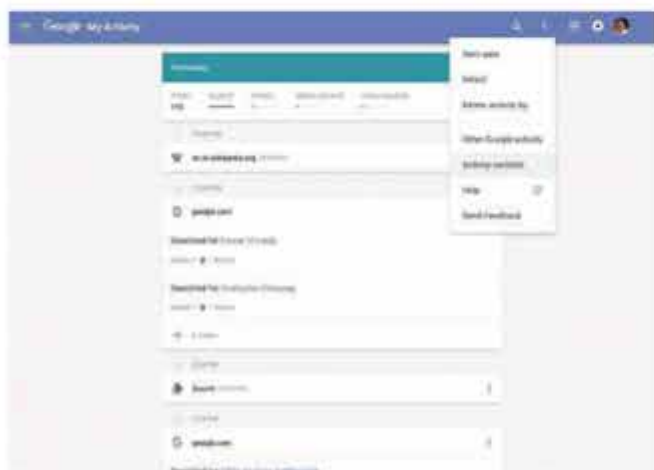


Stop Saving Your Activity In Google

Once you've deleted data from Google, you may want to consider preventing it from saving any more.

1. Go To Activity Controls

Click on the main menu at the top of the screen and select Activity controls from the drop-down menu. This will take you to the Activity Control screen.



2. Viewing Activities

You'll see various boxes as you scroll down the screen. The first one is Web & App Activity. Note the slider in the top-right corner. Move it to off.



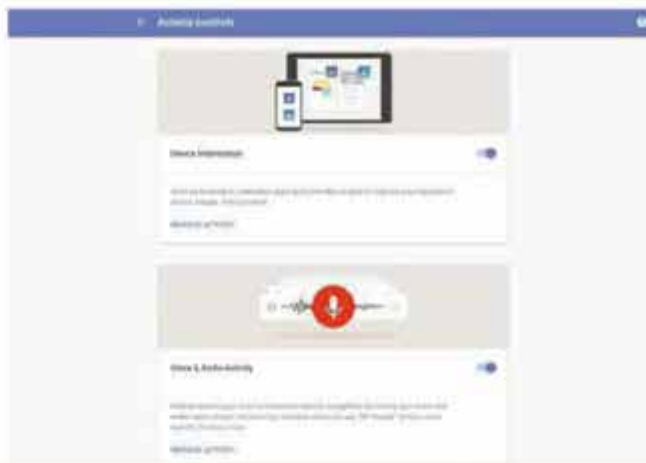
3. Are You Sure?

Google doesn't particularly want you to do this. Whenever you try to turn off any of its data collection functions, it always gives a reason why you shouldn't.



4. Location History

Keep going down the list, deciding if you want Google to log your location history, device information, voice and audio activity, YouTube search history and more.



machine cookie and browser information. Your current address and past addresses are listed. Location information is retained too. The file contains ad topics based on your stated likes, interests and other data; any conversations and connections you have; facial recognition data; emails – even those you've deleted; linked accounts; notes; phone numbers; political views and much more.

It's quite an eye-opener, and it goes well beyond the info gleaned from that time you posted a picture of a cat. But – and here's the catch – if you want Facebook to remove everything it knows about you, then you'll have to leave the service entirely. As you've already seen with email data, just deleting a piece of information doesn't mean Facebook forgets it. Instead, it forms part of your file, so you have to go to www.facebook.com/help/delete_account and request a full wipe.

“ We all have a ‘right to be forgotten’ ”

This will take up to 90 days to complete, but even then not everything will disappear. Anything you've sent to a friend, for instance, will live on until he or she deletes it. What's more, that content will continue to fall under the Facebook licence – the agreement you signed up to that says videos and photos can be used on a non-exclusive, transferable, sub-licensable, royalty-free worldwide licence agreement. Some things, it would seem, we just have to live with.

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LinkedIn Data Retention?

Is that the same with LinkedIn? It seems not. The official LinkedIn policy is that your profile will be kept until you close your account. It will then start to remove information within 24 hours and de-identify logs and backup information within 30 days. But what does LinkedIn hold about you?

LinkedIn says it will keep IP access logs and other information not viewable through your profile, such as the adverts you've clicked, any ad targeting criteria and your login attempts, including the machine you've used and its IP address. LinkedIn's privacy policy says you can request these details through its Help Center – yet the link it provides is frustratingly broken.

We finally found the information after some digging around, and it's good news: you can request your data archive by going to www.linkedin.com/settings/data-export-page, receiving the information in two batches, the second of which will be sent 24 hours after the first. If deleting your account feels too dramatic, you can also go to LinkedIn's new Privacy & Setting page, which lets you determine the things that can be seen about you and the information that can be used. At the very least, you may want to take a closer look at the third-party apps that can view your data.

Social media sites aren't the only ones storing data that you may want to delete, though. Retailers such as Amazon keep information about you, and you don't even have to be logged in to get the gist of what it knows: the items on its home page prior to sign-in are uncannily linked to your preferences. Amazon also keeps a log of your browsing history, and it makes a note of your location history if you're buying on a mobile device. You can't shop on Amazon if cookies are not enabled either.

To remove some of this data, you can go to the Settings, and manage your advertising preferences and you can also delete parts of your browsing history. The same is true of other retail sites, so delete accounts you don't use or delve into the settings to see what can be removed. Altering phone numbers and addresses will disrupt information on sites that don't have a clear deletion policy.

Around The Web

But what about the information that has been put out there about you by other people? As vain as it may sound, you should perform a search on your name in Google to see if some websites contain information about you that you would rather wasn't there. In 2014, the Court of Justice of the European Union ruled that we all had a 'right to be forgotten', and it has

meant that you can apply to Google to have links to personal data or posts about you removed.

There's an online removal form at goo.gl/3afoo8, which asks for the name you used to search, your full name and the URLs you want to be removed. A team at Google then assesses the request, balancing your privacy rights with the public's interest to know and the right to distribute information.

While this doesn't take down the information contained on the actual website, it does make it more difficult for people to find it through Google. Of course, this means you'll need to request that links are removed on other search engines. For Bing, you need to go to goo.gl/oFXWUE and fill in a similar but more probing form, and for Yahoo, you can go to goo.gl/eU2q1y.

There are companies that will look to do all of this on your behalf if you're willing to pay, but it's easy enough to do it yourself. If you want content removed from the actual website, then you need to locate the web editor and request the information is removed there too. Simply look on the Contacts or About Me pages of a site, or search whois.com for the domain name to find details of the person

“ Social media sites aren't the only ones storing data that you may want to delete, though. Retailers such as Amazon keep information about you ”

you need to get hold of. But be warned: if the information is on a newspaper and it is factual and legal, an editor is very unlikely to take it down.

But what of the data being collected by third parties? There are lots of data brokers around, which collect data about internet users such as Spokeo (spokeo.com/uk) and CrunchBase. It's hard to request information from each of these individually, and there'll be a fair bit of legwork involved. You may find it's not worth the hassle, or you may want to look for and pay for a service that will do it on your behalf. The truth is, though, that anyone using the web is powerless to do everything they can to protect their data.

Some companies make life easier. Acxiom (acxiom.co.uk) supplies businesses with marketing data that includes information taken from the internet, and it has a website called aboutthedata.com, which explains how it uses it and why it collects it. Unfortunately, it's only available for use if you have an American address; anyone outside the US won't be allowed to see and edit the marketing data that may have been gathered about you.

With an afternoon set aside and a bit of effort, you can regain control of the internet and what it knows about you. It's unlikely you'll ever be able to erase yourself entirely from the internet and go off-grid, but you can at least minimise your footprint. Don't let the world of Big Data win, no matter how pervasive it may be. [mm](#)



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Technology U-Turns

Mark Pickavance looks at companies that reversed their positions once they realised they'd been heading in the wrong direction.

History is full of figures who plough on regardless until their metaphorical ocean liner meets its icy nemesis. Psychologists would present these situations as an example of how we can hang on to a world view beyond all reason mostly because of inherent narcissistic tendencies.

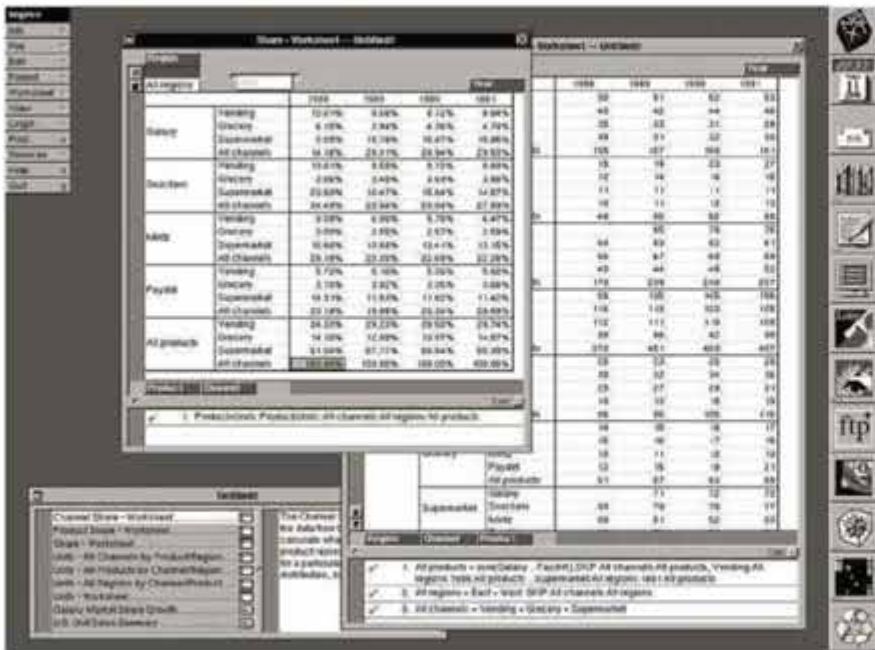
If it's difficult for some people to change direction once underway, those issues multiply when it's an entire executive board of a major multinational calling those shots.

From the outside these events often play out like a slow motion train wreck, where it's obvious what happens next even if those aboard seem mostly oblivious. But eventually even those at the centre of the vortex have to accept that they're headed in the wrong direction and that taken a multi-billion dollar operation along for the ride.

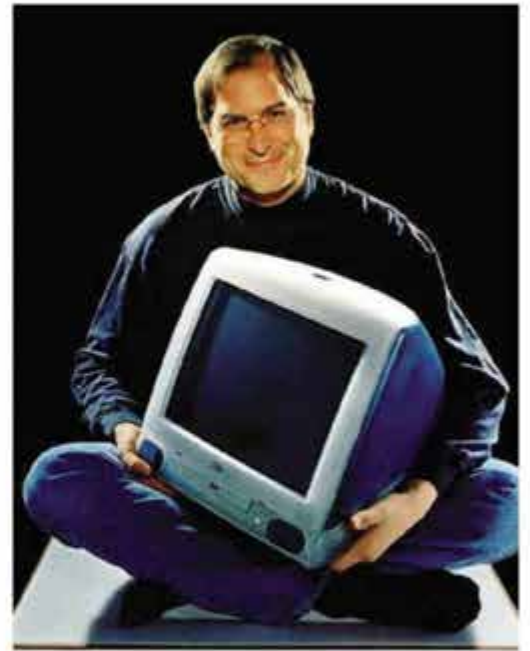
I've compiled a short list of tech companies that have made dramatic about-turns when they've realised the folly of their strategy. Some managed to reverse the fortunes, while others just put an extra twist in the end of their collective failures.

Lotus 1-2-3

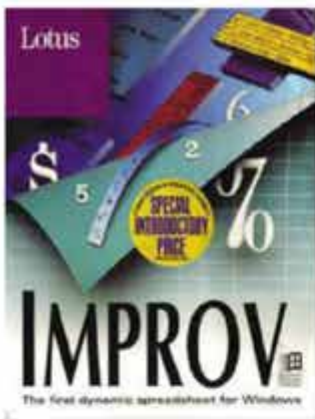
In 1985, Microsoft launched a new spreadsheet program called Excel on the Apple Macintosh platform. Reviewers said nice



▲ Lotus had a graphic spreadsheet that was a real competitor for Excel, but instead decided to drive Lotus 1-2-3 into the ground



▲ Steve Jobs with the Apple iMac G3 PowerPC. He loved that chip, but he didn't handle well waiting for new versions



things about it generally, but 99% of the world's accountancy departments ran on DOS. The majority of those used Lotus 1-2-3, making Lotus one of the biggest software companies in the world at the time.

It also became one that kept making poor choices and then having to unravel them at a later stage – or at least try to.

Things first started to go wrong for Lotus and its spreadsheet software when it was decided to move the code

from a super-efficient macro assembler into the C language, so in theory it would be easier for the software engineers to debug and develop.

On paper, this seemed a great plan, other than the machine coded version of 1-2-3 used most of the memory of a standard PC. So, confusingly, instead of version 3 replacing version 2, it was launched alongside it for those with extended memory only.

Having put huge amounts of effort into two DOS versions, it had allocated very little resources to a Windows release and was entirely wrong footed when Windows 3 arrived and achieved massive popularity. Those who had worked on 1-2-3 demanded a Windows version, and Lotus fumbled around trying to find its elbow and coming up with another part of its anatomy.

Eventually it did launch a Windows version that was just the DOS version with a Windows interface, sadly. It didn't use any of the significant features of Windows and convinced most customers to shift to Excel, if they weren't there already.

The fine irony of this procrastination was that all along Lotus had a great spreadsheet for Windows; it was called Lotus Improv.

Originally designed for Steve Jobs's NeXTSTEP platform, this was a totally new spreadsheet built for a graphical interface

from the ground up. The NeXTSTEP version was released in 1991 and the Windows version two years later.

Reviewers adored it, with many describing it as the best spreadsheet program they'd used and certainly the best one that Lotus ever made.

Unfortunately, not wanting to tread on Lotus 1-2-3 revenue, the marketing of Improv left a lot to be desired; none of the sales people understood the product, and sales were predictably poor.

In retrospect, this was a nadir for Lotus, where it had the best product but failed to see that and instead backed an over-the-hill nag. Improv was officially killed in 1996 when IBM purchased Lotus, and 1-2-3 ended up in the disastrous Lotus SmartSuite series.

The catalogue of failure at Lotus was mostly about changing direction at a point that was far too late to bring about the advantage it expected – or just making the wrong call and then having to mitigate that mistake with a reversal further down the line.

Intel - Pentium 4 And Itanium

For many years, Intel played the tune with its processors, and the PC industry danced to it. From the point that IBM decided to use the Intel 8088 processor, it was in the driving seat, and the company grew to be a massive commercial success on the back of that one deal.

Where some companies have less than glowing years after initial success, Intel defied those odds and built success on success. Soon PC's had 'Intel Inside' stickers to tell you that this wasn't any old processor, and things reached fever pitch when performance levels got successive kicks with the Pentium, Pentium 2, Pentium Pro and Pentium III.



► The Pentium 4 Prescott, when Intel's Netburst architecture plans hit the buffers

And then, possibly because all this success had gone to its head, it decided to scrap most of what it had built before and embarked on two really disastrous projects: the Pentium 4 and Itanium. In retrospect, both of them were built on assumptions that made little or no sense, and because of that, neither of them took Intel where it expected to go.

The Itanium was seen as the way that Intel would move into 64-bit computing to compete with the likes of MIPS, PowerPC and SPARC, so it retained virtually no compatibility with the x86 architecture that Intel had built for the PC.

In Intel's mind, it wouldn't matter, because these processors were made for 'big tin' makers, who'd recompile their operating systems for the new architecture just like they did for other chip makers.

While a few system builders took the Itanium, it was generally considered to be a poor performer. Eventually HP, the last company that used it in anger was forced to pay Intel to keep on making them. As far as I'm aware, Intel now directs those customers to its x86-compatible Xeon processors, and it's never admitted how many Itaniums it's sold or if the project ever made any profit.

But while the Itanium failed mostly behind closed doors, the Pentium 4 calamity played out in the full public gaze. Even as the first products reached the first reviewers, there was something not right with the radical Netburst architecture Intel had devised for the P4. While it performed admirably in benchmarks, it ran much hotter than the P3, consumed greater amounts of power, and initially Intel insisted that it be coupled with very expensive RAMBUS memory.

There's a whole other story about how RAMBUS manipulated the JEDEC Solid State Technology Association that I won't cover here, but this memory was so expensive that it hurt early sales of the P4 from the outset.

In desperation, Intel started selling a CPU, an Intel-branded motherboard and throwing in some free sticks of RAMBUS memory just to get enthusiasts interested in using the platform.

It didn't help that in certain circumstances it was possible to get the last of the P3 series to go quicker, and there were unresolved questions about where this technology would ultimately take the PC.

Intel said Netburst could go to 10GHz, but in reality it hit the buffers with the 3.73GHz Prescott Extreme Edition in early 2005. This CPU consumed a whopping 115 watts, and Intel recommended a BTX case to provide the level of cooling needed to stop it melting.

When AMD launched the Opteron, it became obvious that Intel had backed two wrong horses in succession. First, it dumped RAMBUS for DDR3, then it ditched Netburst in favour of reworking the Pentium III into the Core series, and it also embraced x86-64, making the Itanium largely pointless.

Microsoft - Linux

In the mid-90s Microsoft was extremely poor at playing nicely with others. It aggressively set about trying to crush any business or technology that stood between it and selling the most successful operating system on the planet. Microsoft saw off the alternative versions of DOS, then it banished IBM's OS/2, and when Linux started to become popular, it decided it would kill that off before it grew into anything likely to threaten Windows sales. If this seems like a plot from *Game of Thrones*, that's a reasonable analogy.

In an attempt to throw its not inconsiderable corporate weight around, Microsoft told PC makers that if they installed

Linux on any PC they'd pay more per Windows licence or that maybe they wouldn't get licences at all. Unfortunately for Microsoft, these activities had not gone unnoticed, and it eventually became embroiled in an anti-trust investigation, where some of the darker things the company did to maintain its market position came out.

Along with these complications, Microsoft was also wrestling with how best to compete with a product that was effectively free, when Windows wasn't. This was an ironic dilemma, because being free was exactly the same weapon that Microsoft had used on Netscape and others when it attempted to dominate the browser market with Internet Explorer. Now this method was being used against it, it didn't seem such a fun idea.

In 2001, the same year the antitrust case was settled, Microsoft strategists decided the best way to deal with Linux, when they couldn't bully PC makers, was to wrap it up in legal knots. To this end, Microsoft accused Linux of infringing its patents and copyrights, but it was careful not to actually state what it considered to be infringed, so it couldn't be rebuffed. This fear, uncertainty and doubt exercise went on for the

“ Intel said Netburst could go to 10GHz, but in reality it hit the buffers with the 3.73GHz Prescott Extreme Edition in early 2005 ”

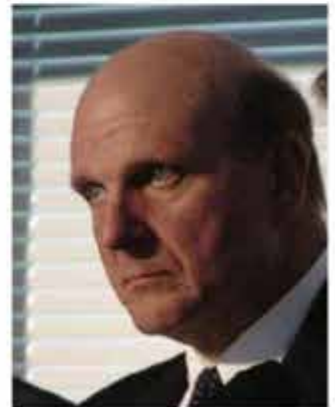
better part of the next decade, with Microsoft even financially backing software company SCO in an attempt to dispute the ownership of Unix, the foundations on which Linux was built.

One major target for Microsoft was the GNU GPL (General Public License), which clearly stated that if a piece of code was issued under this licence, it was no longer copyrighted.

CEO Steve Ballmer even went out of his way to work with the Chicago Sun-Times on what looked like an interview, but was more of an infomercial in which he outrageously said, "Linux is a cancer that attaches itself in an intellectual property sense to everything it touches."

He then outlined the laughable assertion that "The way the licence is written, if you use any open-source software, you have to make the rest of your software open source." This was patently bunkum, but nobody ever criticised Steve Ballmer for not throwing his substantial weight behind an idea even if it had little or no basis in reality.

But this story is all about reversals, so when did all that happen? It wasn't something that happened overnight; it was more of a creeping transformation that really started to set in once senior people at Microsoft realised that they'd crested the hill with Windows, and success in the



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▲ Having once had a CEO that called Linux 'a cancer', Microsoft now makes software tools to help developers create software for Android, a derivative of Linux

future for the company would involve commercial compromise and not naked aggression.

Even before Steve Ballmer exited from the CEO role, Microsoft had already accepted that it would tolerate Linux in respect of Android, by licensing these undefined copyrights to phone companies for a modest sum per device. But even with a small amount per phone, this was a billion dollar a year business that required Microsoft to do very little indeed.

With Microsoft failing to gain any traction in the phone market and Apple a largely closed world to it, it's since embraced Linux (and Android) with a range of software services, including the portable version of Office 365.

For system admins, Windows 10 now has the Bash command line features. It's also created SQL Server for the platform and even given Linux Azure certification.

To quote current CEO Satya Nadella, "Microsoft loves Linux." That's a pretty radial about-face, even by Microsoft's standards, and it demonstrates that Microsoft's world view has undergone an epiphany of sorts.

Apple And PowerPC

From the outset, Apple engineers prided themselves on doing things in their own special way, and that philosophy took them quite far. Where IBM went with Intel and its x86 platform, Apple used the Motorola 68000 series chips in its Lisa and Macintosh computers.

Having done what it could with the 68000, Apple passed on the 88000 and started to look for alternatives, and it even considered building its own chips at one point. Even for a company the size of Apple, designing and fabricating microprocessors was an expensive endeavour, so instead of going it alone, it joined with IBM and Motorola to create a family of single-chip microprocessors based on the POWER architecture. The alliance they formed was called AIM.

The new PowerPC-based Macs that this eventually resulted in were the performance kings of their era, and they were generally superior to PC technology of the time. But you could also get PowerPC-based designs from other hardware vendors like NEC and Sun, and the OS support for the architecture included Solaris, AIX Unix, OS/2 and eventually even Windows NT.

“ In retrospect, this was a nadir for Lotus, where it had the best product but failed to see that and instead backed an over-the-hill nag ”

For Apple, it provided a means to differentiate its products from Intel-based PCs and propagate the notion that the company had a technological 'special sauce' that only the Apple Mac user could experience. Fans of its products bought heavily into this idea and the argument that a PC would never be as good as a Mac because of PowerPC, among other unique features.

However, behind the scenes, things weren't special, and Apple became increasingly frustrated by the speed at which Motorola delivered new chip models. It wasn't keeping pace with Intel's development cycle and it would soon be overtaken. Steve Jobs was famously furious that when he'd launched the first machines with the PowerPC G5 in them in 2003, he'd

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“ Those choices confused gamers, but some of Microsoft’s new rules regarding digital rights management utterly infuriated them ”

promised a 3GHz version within a year, and two years later it still hadn’t materialised.

IBM was also repositioning itself, selling its stake in the 32-bit PowerPC processors and pushing the 64-bit models into repurposing for the console gaming market.

All the consoles of the era used a PowerPC-based chip, including the Nintendo’s GameCube and Wii, Sony’s PlayStation 3 and Microsoft’s Xbox 360. Eventually overtaken by Intel’s latest generation in 2005, Apple finally called time on the PowerPC and did what would have seemed open heresy just a few years earlier by shifting its product range to Intel.

The angst this caused among its most strident supporters was huge, though many tried to maintain that an Apple Mac would still be better than a PC, even if they shared the vast majority of parts.

As a way of placating those most ardent fans, Apple pushed the idea that it had a special deal with Intel where it would get the latest technology before other PC makers and that Apple would get unique chip versions.

None of this really came to pass, because the economic reality is that Dell and HP are much bigger customers of Intel than Apple are.

Eventually the shock of this about-turn by Apple was cushioned by the decline in importance of the Mac in Apple’s product line. People generally buy Apple products because of

how they look and feel and not what’s inside of them. And because they’re Intel, they can run Windows if the user wants that option.

Instead of Apple being on the bleeding edge of Intel technology, it’s common these days to see it one step behind, happier for others to resolve the teething issues with any new range before it commits to using them in its new MacBook or iMac ranges.

Microsoft - The Xbox One

As a company, Microsoft has something of a track record of holding an indefensible position to a point and beyond, when any other business would have backed off. But very early on in the story of the Xbox One, it was evident that lots of decisions about this console had been made without much thought to how they’d play with those buying it.

Where the Xbox 360 was primarily a gaming platform with some minor nods to media playing, the Xbox One seemed to flip those priorities in an attempt to make the device the centre of the living space and an integral part of TV and media systems. These choices confused gamers, but some of Microsoft’s new rules regarding digital rights management utterly infuriated them.

The original plan outlined before launch was that games would be linked directly to the purchaser’s Microsoft account, so no market for second-hand games would exist. Microsoft believed that by doing this, it would free users to play their games on others consoles and share them with family members and that gamers would prefer this to being able to resell their games. They were wrong, and it was painted by many in the media as it building a model to advantage the software vendors over its own customers.

Eventually, as the story spun entirely out of control, Microsoft changed its mind and allowed physical game reselling in what turned out to be the start of many flips it would do with this console.

The biggest mistake that Microsoft made and the one it took the longest to address was the inclusion of the Kinect 2.0 hardware. Previously on the Xbox 360, Microsoft had sold about 24 million Kinect devices, with roughly a third of all consoles having the facility. That level of market penetration somehow translated into a strategy on the Xbox one that the console would come with this hardware as standard, even if that bumped up the cost by at least \$100.

Not soon after the launch a number of negative stories about the peripheral circulated, mostly based on the fact it was



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always listening to people around it, even when the console appeared to be off.

Initially the console wouldn't work without it connected, even if enthusiasts discovered that the machine was at least 10% quicker when it wasn't attached.

With Xbox One sales lagging Sony's PS4 by at least 50%, Microsoft was forced again to remove the always connected requirement for the Kinect, and eventually it launched the console in a stand-alone format to reduce the price differential with its competitor.

In another change of direction, it also shifted the emphasis of the Xbox One back to gaming, as the number of consoles that use the media functionality is relatively small, and much of the special cable/satellite overlay functionality doesn't work outside the USA.

In short the Xbox One has been one long list of set-in-stone decisions that magically got undone when Microsoft realised how bad for business they were.

Nokia - Symbian, MeeGo And Windows Phone

From the perspective of 2016, it's hard to accept that it was ten years ago when Nokia was the world's biggest phone maker and one of the most successful brands ever. It had some less than successful designs like the N-Gage, but business users loved the greater battery life and reliability that products like the Nokia 3510 delivered.

However, things really started to go wrong for Nokia when Apple released the iPhone and it became apparent that it just wasn't ready for the smartphone revolution.

Nokia's strategy at the time was to use an old OS created by Psion in the 1990s, called Symbian. And in 2006, 67% of all smartphones sold used this OS as their platform. As an owner of Symbian smartphone, its limitations were obvious, because Nokia hadn't really considered how a software infrastructure would work or what sort of power the phone would need to make it genuinely responsive.

The Apple user experience was therefore a revelation and one that presented Nokia with a dilemma, regarding how it would compete in this new era. Very oddly, the company seemed determined to stick with Symbian, and in 2008, it doubled down on that bet and bought Symbian Ltd and threw

large numbers of its own engineers at the codebase in an attempt to address the numerous limitations.

Not everyone in Nokia was convinced by this, so a fall-back plan was put in place, where Symbian would be a transitional OS that would eventually be replaced by MeeGo, a mobile device OS that was based on Linux (like Android) from code contributed by Intel.

Nokia even went as far as to create some prototype MeeGo phones and show them to the press and potential business customers. But while it tried to fix Symbian and work on MeeGo, the market share of Nokia declined at gathering pace, dropping nearly 8% in a single quarter in 2010. The investors panicked, and the board dismissed the CEO and invited ex-Microsoft VP Stephen Elop to replace him.

In the coming months, whatever plans Nokia had previously for reversing its decline went out of the window, as Elop first announced a partnership with Microsoft, then got \$5bn from it, and eventually decided that Symbian and MeeGo would be replaced by Windows Phone OS. Eventually, in an attempt to secure what Windows Phone products that were being made, Microsoft bought Nokia's phone business.

The short version of that story is that the Nokia brand is no more, the majority of people who worked for Nokia no longer work for Microsoft, and the Windows Phone projects is effectively dead, as are Symbian and MeeGo.

Nokia made bad choices in the first few years of the century with Symbian, compounded those by sticking with that OS, didn't progress MeeGo, then junked them both for another OS turkey and ultimate oblivion was the result.

In the end, it didn't really matter how many radical plan changes Nokia made; it kept coming back to the same dire place. [mm](#)



► The Nokia N9, a MeeGo phone that Nokia junked to join the massively successful Windows Phone platform

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26 Billion Or How To Ignore Problems

So Microsoft has a spare 26 billion just hanging around to buy LinkedIn. Maybe they should have used some of that to employ a few hundred competent programmers to replace the bumbling idiots who are at the moment working to improve your Windows experience.

Clipboard: Has been around for years but has never been improved. A simple job of copying two or three files or pictures is a long drawn out process.

Windows Defender: About as good as leaving your light's on and your front door unlocked. That 26 billion could have bought an antivirus company.

Search: About as good as looking for a pin in the pitch black. It's amazing how many unrelated items turn up in a simple search.

Restore: Many years ago I tried on several occasions to use the restore function, but each time it failed to do what it claimed. I now have several hundred CDs and DVDs with the last 20 or so years of work on them; it's safer to trust myself than Microsoft, having had the endless joy of using the Millennium Edition and becoming acquainted with the BSOD quite often.

Zip: I send files to my sister in Australia every so often, but Microsoft has yet to realise there are better ways of compressing files than Zip.

Disk Cleanup: Together with Uninstaller, it's proof that the people who work for Microsoft have as much idea how to write a program as next-door's cat. I think that cat might do a better job by randomly hitting the keys.

These are a few of the ignored problems with Windows, but I can bet most of your readers know of many more, and the little programs that helped a few but were dropped in an improved version of Windows.

I know there are other programs that do all of the things mentioned, but when Ford produce a new range of cars, they don't put in 1920s brakes and engine and expect you to upgrade it with free parts. I was hoping when Microsoft got rid of Mr Ballmer it may have lost it's 'we know best' attitude but, it seems Satya Nadella is cut from the same cloth.

Dave Shaw

Memory

I enjoyed David Hayward's article on conventional memory, and it reminded me of the troubles I had back in the days of DOS. I had extra problems once I used DoubleSpace to compress my drive, as the driver for that absolutely had to be loaded before I could access the disk. Despite all that, I still miss the days when we could directly access memory in the CPU's Real mode. One of the reasons it took so long to properly use memory above 1MB is because you have to enter the CPU's protected mode – and that really is protected! Protected mode uses virtual memory exclusively. Every task including the OS is allocated a block of virtual

memory up to 4MB in size, and the memory management unit (MMU) in the CPU keeps tables mapping that into real memory or even a swap file. Tasks cannot access real memory directly. To enable programs to access things like the OS, which are outside their allotted area, they can use a SystemCall instruction, which is new to protected mode. One problem with this is that a 32-bit program like the OS cannot call 16-bit code, so all the drivers in the BIOS are useless to it. These are just some of the reasons it took so long. Anyway, hope that's clearer than mud, and keep up the good work.

Graham Dearsley

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Alphabet Pi:

T

David Briddock meanders through Raspberry Pi technology from A to Z

THIS WEEK: Terminal Windows, Touchscreen and TV

Terminal Windows

All Linux operating systems have a command line mode. This is the default mode before any GUI desktop is displayed, and even when a GUI is running you can open one or more terminal windows to enter commands.

On a Raspberry Pi running Raspbian the default terminal app is LXTerminal. This will start up the bash shell, where you can enter system commands or create shell scripts, which group a series of commands into a single executable file.

Frequently used commands include `cp` (file copy), `mv` (file move), `rm` (file remove), `mkdir` (create a directory), `ls` (list files in a directory) and `cat` (display a file contents). The manual pages provide information about each command, including all the command options and some common-use examples. For instance, to find out more about the file copy command you'd enter `'man cp'`.

“ At around £50 the touchscreen display kit is excellent value for money ”

With Raspbian you can see previously entered commands using the up arrow key. Then just press the Enter key to rerun a command. Any of these historical commands can be edited before execution.

Certain powerful Linux commands require system root user privileges to run. There's no root user in Raspbian, but the `'sudo'` prefix offers temporary access to these privileges. However, `sudo` prefixed commands often change the operating system in non-reversible ways, so proceed with caution.

Touchscreen

On the 8th September 2015, the Raspberry Pi Foundation launched its official Raspberry Pi touchscreen display kit. It's compatible with the Pi 3, Pi 2, Model B+ and Model A+, but unfortunately the older Raspberry Pi Model A or Model B are currently not supported.

It's a 7", 10-point capacitive touchscreen display (meaning it can read up to 10 simultaneous finger touches for control) with 800 x 480 pixel resolution, 24-bit RGB colour, and a 70° viewing angle. It also supports up to 60 frames-per-second video playback making it very media-friendly.



▲ Touch Display

This official touchscreen is only available in kit form, though, which includes the 7" Touch Display, an Adapter Board with mount and screws, Adapter Board GPIO jumper wires, a DSI Ribbon cable and a Perspex frame (in various colours) which the user must assemble themselves. Search online and you'll discover quite a few step-by-step explanations of display kit construction. There are a few video demonstrations too. For example, Alex Eames' how-to (goo.gl/QaC9Wu) is a good place to start.

Considering the quality and functionality on offer, at around £50 the touchscreen display kit is an excellent value for money option if you'd like to free your Pi from the constraints of a TV or monitor. It is available to buy from many online suppliers.

TV

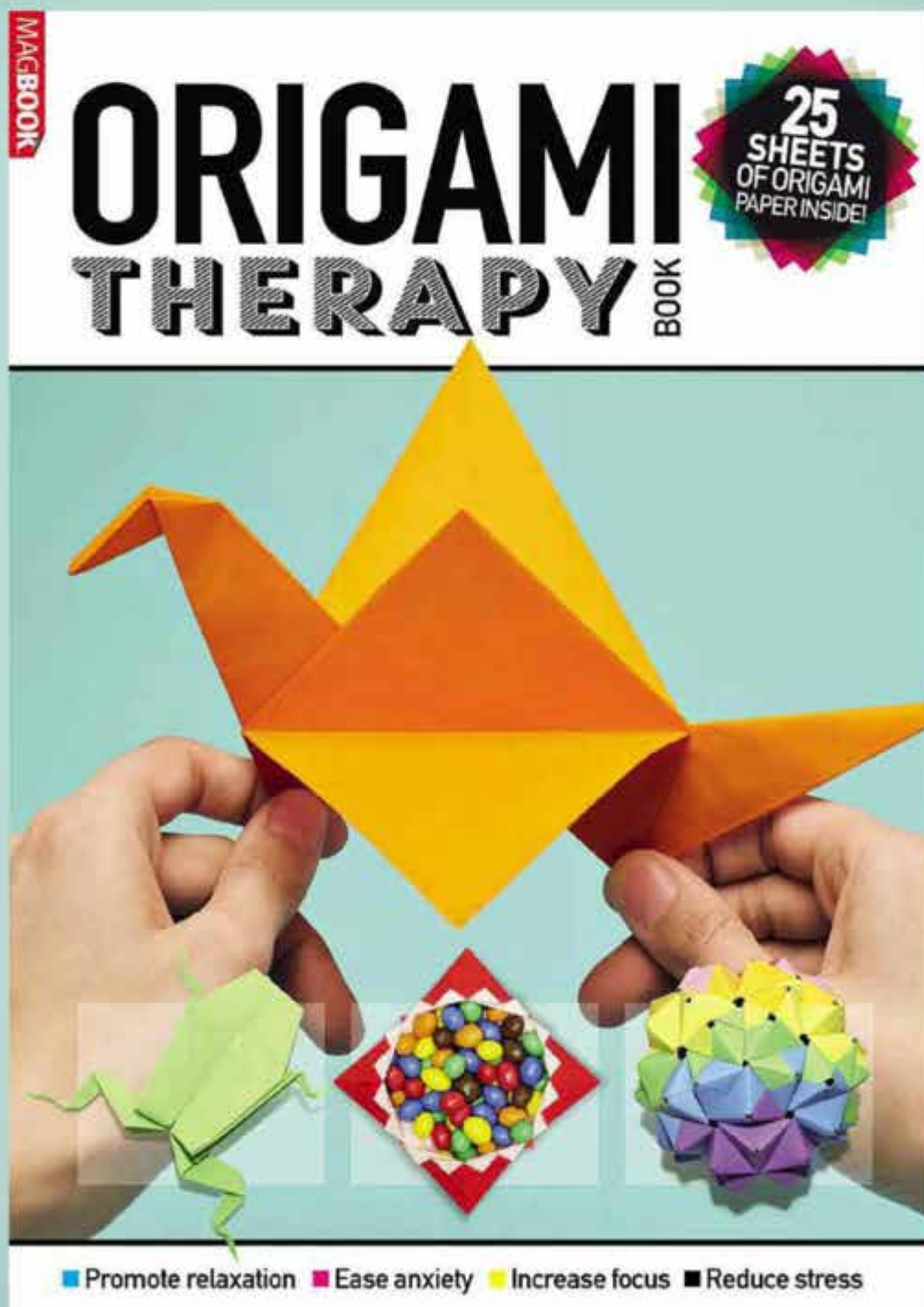
Every Raspberry Pi has an HDMI port, which means TV-centric video and audio media streaming projects are pretty straightforward exercises. What's more, with such a small board it's easy to hide the Pi round the back of a TV screen.

Some of these projects turn the Pi into a fully-featured digital TV recording platform, including a programme scheduling feature and the capability to watch one channel while recording another. The more powerful quad-core Raspberry Pi 3 and Pi 2 chips are particularly suited to this kind of project.

A good place to find out more is the Kodi.TV website (kodi.wiki/view/PVR). To get you started there are a number of Kodi-based distribution images, such as OpenELEC (openelec.tv), OSMC (osmc.tv) and XBian (xbian.org). [mm](#)

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Component Watch

Even if you're shopping at the more expensive end of the monitor market, there are still some good deals to be had

We look at monitors a lot (no pun intended), but usually they're priced to sit at the low-end or middle-ground of the market. What if you want a monitor that's all-singing, all-dancing, and big enough to fill your entire field of vision, though? Are there still good deals to be had at the top-end of the price lists? Of course there are – and to prove it, we've found you a bunch of them.

Deal 1: Philips BDM4350UC
RRP: £540 / Deal Price: £500

At a whopping 43" this Philips monitor is one of the largest on the market. Pleasingly, its 4K, IPS panel is more than up to the task at hand – offering a quick-ish 5ms response time that's certainly faster than some, built-in 7W stereo speakers, three handy USB 3.0 ports (one of which is fast-charging), HDMI and dual DisplayPort inputs, and VESA-compatible mount. It's clearly designed to work as a TV just as well as it would as a monitor for a computer, design and specification choices that makes it a great option for users of HTPCs and media boxes.

Where to get it: Overclockers (bit.ly/29xP6iF)



Deal 2: Asus PG27AQ
RRP: £836 / Deal Price: £630

This 27" monitor is much smaller, but also has a 4K resolution (3840 x 2160). To this it adds a handy height-adjustable stand, as well as offering the usual HDMI and DisplayPort inputs but a very slightly quicker 4ms response time on its IPS panel. It was voted the best 4K monitor of 2015, but if the specs and accolades alone aren't enough to sway you maybe the free copy of Doom you'll get if you buy before the end of August is. Designed for gamers, it has a special bright/high-contrast gaming mode with crosshair overlays, an FPS counter and a time available within the monitor's HUD. There's also low-blue-light support for night gaming, alongside a pair of 2W speakers.

Where to get it: CCL (bit.ly/29zcs3H)



Deal 3: BenQ BL3201PT
RRP: £750 / Deal Price: £685

This 32" 4K (3840 x 2160) monitor has a 4ms response, HDMI and DisplayPort inputs, and a VESA mount. What really catches the eye, though, is its 10-bit display panel and CAD/CAM mode. Designed for professional and high-fidelity use, it's ideal for video editors and artists. There's also Picture-in-Picture and Picture-By-Picture support, two 5W speakers, a line-in and headphone/line-out.

Where to get it: Ebuyer (bit.ly/2a0C2mH)



Deal 4: Samsung U32E850R
RRP: £950 / Deal Price: £710

Samsung's has a good name, and that goes double for its top-class monitors. This 4K 32" screen has a resolution of 3840 x 2160, a 4ms response time and FreeSync technology to minimise latency and tearing. Picture-in-Picture, Picture-by-Picture, gaming and low-light modes are just the start of its many features. It has dual HDMI-in, DisplayPort, Mini DisplayPort, and four USB 3.0 ports with fast-charge support. There are no speakers, but you can buy an optional soundbar that mounts seamlessly on the rear of the monitor. Impressive.

Where to get it: Appliances Direct (bit.ly/29LyzXp)



Deal 5: Acer Predator XB321HK
RRP: £760 / Deal Price: £719

The Predator's a super high-end 32" gaming monitor with G-Sync support, a 4K/UHD screen and height-adjustable stand. It's 4ms response time, HDMI and DisplayPort connectivity and a USB 3.0 port make it a solid choice, but the GameView mode enhances blacks and colours for ideal gaming performance. It's light on features, but the money's gone on the screen!

Where to get it: Scan (bit.ly/29Sgsy6)



Remembering... Mastertronic

David Hayward recalls a time when games cost just £1.99

My son wanted to buy a new PC game the other day. He asked if it was okay to enter his details into Steam and for me to check whether he'd done everything correctly.

When I looked at the details, though, I nearly fell off the chair: £78 for a game (with some DLC extras)! After I'd recovered from the shock, I began to think about how our generation used to save up our 50p weekly pocket money until we could eventually afford a Spectrum game. We'd copy down the games we wanted from Crash and trudge off to John Menzies on a wet Saturday morning to see if we could get hold of it – with our accumulated pocket money tightly grasped in our clammy mitts.

£78 is still a ridiculous amount of money, but while I was boring my son with tales of my youth, I fondly recalled the saviour of many a cash-strapped 80s gaming teen: Mastertronic.

Where most Spectrum games cost anything from £5.99 up to £20 in some extreme circumstances, Mastertronic pitched its wares well under the price radar at just £1.99 or £2.99 when sold under the M.A.D. (Mastertronic Added Dimension) label. Such a low price meant we could happily manage at least one game per month, which fed our itchy trigger fingers.

However, not all the games produced at such a low price were good. In fact, a lot of them were pretty dire. *Voyage into the Unknown* was one example of just how poor

a £1.99 game could be. On the other hand, there were some superb titles available, such as *Feud* (released on the Bulldog label), *Knight Tyme* (from the M.A.D. label), *180* the darts game and *Agent X*.

Its History

Mastertronic was formed by Martin Alper, Frank Herman and Alan Sharam toward the end of 1983. The idea behind the business model was simple enough: to provide the new generation of home computer users games that would cost less than £3.

Mastertronic started trading on 1st April 1984, from the back room of Alan Sharam's office in the West End of London. The name Mastertronic was devised through being the master of a potential chain of distributors and publishers, each of which were planned to have the Master prefix.

The marketing behind Mastertronic was genius, in a time where shops were a little wary of selling computer games. With no cost or outlay to the shop, they would only pay for the games they sold, and the company hit the ground running. And thanks to the full-colour cassette inlays, the shelves of the time were quickly cleared of Mastertronic stock.

1985 saw the launch of the M.A.D. label, with games selling a little higher at £2.99 and with a slight improvement in terms of quality. In 1987, the company launched the Bulldog label to sell British made games to the American market, and in that same year

Did You Know?

- The top selling Mastertonic title was *Formula One Simulator*, with 558,013 units sold.
- Mastertronic released a joystick in 1986 called the *Magnum*, for £12.50.
- Mark J Brady and John Smyth were the artists for most of the Mastertronic cassette inlays.
- Mastertronic became Sega's UK distributor the *Sega Master System*.

it bought Melbourne House and launched the Ricochet label to sell re-releases.

By 1988, the company was suffering financially, which drew in Richard Branson, who purchased 45% of the shares, with the remaining still held by the original founders. However, in time, Virgin Games merged the Mastertronic Group Ltd into its Virgin Mastertronic label.

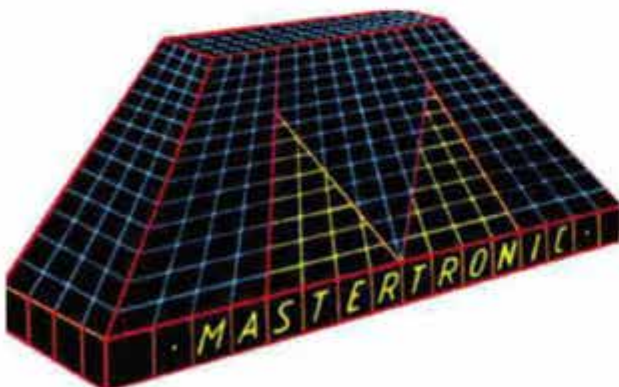
Time moved on and Mastertronic kept its fingers in various pies, most notably Sega. Sadly, though, in November last year, the company entered administration, and its future is uncertain.

The Good

Games that we could afford on a monthly basis!

The Bad

Some of the games were pretty awful. **mm**



▲ The Mastertronic logo, which meant low prices but could often be a gamble



▲ The cassette inlay artwork was superb



▲ *Knight Tyme*: one of the M.A.D. label Magic Knight games and an absolute classic



Jack Dorsey Hacked

Twitter CEO's social media account compromised

Torvalds Rants

Erm, comment syntax is his beef this time

Linus Torvalds has let rip an almighty rant complaining about the apparently thorny issue of comment syntax. In a slightly swearsy post found on the Linux Kernel Mailing List, he called out people for adopting a "brain-damaged stupid networking comment syntax style" and then also rather pointedly complained "If the networking people cannot handle the pure awesomeness that is a balanced and symmetric traditional multi-line C style comments, then instead of the disgusting unbalanced c*** that

you guys use now, please just go all the way to the C++ mode."
There's more.

"I'm not even going to start talking about the people who prefer to 'box in' their comments, and line up both ends and have fancy boxes of stars around the whole thing."

Oooh... 'ark at him!

BlackBerry Ceases Classic Model

Back to touchscreen, then

Confusing times at BlackBerry, eh? It wasn't long ago that the company was proudly announcing a return to its roots with the launch of its latest physical keyboard mobile device, 18 months ago in fact. Now, the company has done a volte-face in announcing that it is going to stop making its Classic model, apparently deciding that actually a touchscreen device is the only way forward.

The bottom line for BlackBerry is that it has been moving away from the hardware and running towards the software side of the business. This latest, somewhat confusing, move is a further sign of that – but leaves us wondering if it will be leaving the handset business altogether before too long. Some analysts certainly believe that's the case, which makes great gossip for magazines such as ours, but must be maddening for BlackBerry's customers and employees.



Hacking group OurMine Security has taken credit for hacking Jack Dorsey's Twitter and Vine accounts, releasing some videos through his Vine feed that also appeared as Tweets. The videos were of the usual "testing your security" variety, so nothing too offensive, but they leave Dorsey as

the latest in an increasingly long line of people targeted by OurMine. Mark Zuckerberg and Google's Sundar Pichai have also been hacked by the group, so he's in good company, we suppose.

This is a little embarrassing for Twitter's own security standards, but we doubt anyone is going to lose any sleep over this particular incursion.



Warner Bros Settles Charges In US

Online marketing campaign "deceived" consumers

The Federal Trade Commission in the United States has said that Warner Bros has settled charges that it "deceived consumers during a marketing campaign" relating to its 2014 game *Middle Earth: Shadow of Mordor*. Specifically, it was accused of "failing to adequately disclose" that it paid online "influencers" – including PewDiePie – several thousands of dollars to post positive gameplay videos on YouTube and social media.

The sponsored videos were viewed over 5.5 million times over the course of the campaign and the FTC has ordered that Warner Bros is banned from

failing to make such disclosures in the future and that it also cannot misrepresent any such sponsored content.

Warner Bros paid each influencer between hundreds to tens of thousands of dollars, plus

they were given a free advance-release copy of the game while being told how to promote it. The FTC also wrote that Warner Bros told influencers to promote the game positively and not disclose bugs or glitches.



If you want to use the internet and get the most from it, then at some point you're going to be giving information about yourself away. Of course, there are steps you can take to minimise how much of your data gets into the hands of others (staying away from social networks is probably a good start), but keeping everything to yourself will be difficult, if not impossible.

Personally, I accept that Google, Facebook, Twitter and their ilk have files about me and how I use their services. In exchange I get what are pretty good products without having to hand over any cash. If I had to pay for my email, my social networking and so on, I simply wouldn't be able to afford it.

Also, I don't think my data could ever be used against me, so I'm not worried about that either.

But in spite of my generally relaxed attitude, I also want to know that I can get that data deleted if should opt out of a service. After all, if I'm not benefitting from them any more, why should they continue to make money out of me?

What are your thoughts on this? Do you worry about what information big companies have on you? Write to letters@micromart and share your thoughts.

Anthony

Meanwhile... On The Internet...

TV and film has a terrible record of portraying what actually happens during a computer hack. Heck, it has struggled with technology at the best of times (tinyurl.com/MMnet23a), but its portrayals of hacking are on a whole other level, where even the best examples often rely on unrealistic tropes (tinyurl.com/MMnet23b) and technobabble (tinyurl.com/MMnet23c). It's easy to see why, though. Hacking is not the most visually stimulating of pastime for those not directly involved (tinyurl.com/MMnet23d), so it's not surprising directors look to compress and alter the goings on (tinyurl.com/MMnet23e) to be more stimulating.

Of course, what starts out as a necessity or simply artistic licence quickly becomes a knowing parody of itself (tinyurl.com/MMnet23f), as the concepts get passed around within an industry acutely aware of its own visual language and conventions, and what works for audiences. Occasionally, something will come along and overturn those bad habits (tinyurl.com/MMnet23k), like *Mr. Robot* has been credited for (tinyurl.com/MMnet23g), but the exceptions will be few and far between.

Ironically, we now live in a world of visualisations, where reality is looking to catch up with fiction, but in a way that allows us to better understand the reality of cyber-security (logstalgia.io) and make us pay more attention to what's going on with our networks (www.digitalattackmap.com). It's unlikely that it'll ever get Hollywood exciting, though... Not least because hacking is a game of patience, and... well... complicated. That's a fact that's well illustrated by the chat between *Motherboard* and well-known hacker George Hotz, aka Geohot (tinyurl.com/MMnet23h). Best known for his work on hacking the iPhone's security in 2007 (tinyurl.com/MMnet23i), and later falling afoul of Sony for his work on circumventing the PlayStation 3's security, he became something of the *enfant terrible* of the scene before parlaying his skills into a gigs with Facebook and Google (tinyurl.com/MMnet23j) before latterly moving into the development of AI.

The video is designed to show the relative simplicity of hacking a system for someone who knows what they're doing and the relatively small toolkit that can be required. It's not the most exciting of watches – as you would expect – with the most interesting element being his reluctance to admit to knowing much about anything. However, when you've spent as much time dealing with lawyers as he has, that's probably not surprising.

We regularly come back to talking about Tor on these pages. In a world that is becoming increasingly paranoid about privacy and security – for fair means or foul – it has become an increasingly important and influential piece of software, both for what it is capable of doing (tinyurl.com/MMnet23l) and in terms of the philosophy driving its development (tinyurl.com/MMnet23m).

While its role in fostering terrorism may not be all some people would like you to believe it is (tinyurl.com/MMnet23n), it has been a target of both security forces and the police for quite some time now (tinyurl.com/MMnet23o), and their attempts to crack down on criminals or others seeking to plot and plan in secret. Therefore, if you're one of the people using it – again, for very good (tinyurl.com/MMnet23p) or very bad (tinyurl.com/MMnet23q) reasons – any changes to the running of the organisation behind Tor will probably be of utmost interest.

The changes, which have seen the entire incumbent Tor Project board of directors resign (tinyurl.com/MMnet23r) and replacements appointed (tinyurl.com/MMnet23s), have come in the wake of accusations of a sexual assault against Jacob Applebaum (tinyurl.com/MMnet23t), one of the project's core developers and a high-profile driver of the Tor service. The anonymous allegations came from a website of unknown origin created specifically for the task (jacobappelbaum.net). They were quickly and vigorously denied by Applebaum, implying that they were another in a series of attempts to discredit him by people opposed to the Tor concept.

"I think it's extremely damaging to the community," he commented on Twitter, "that these character-assassination tactics are being deployed, especially given their ugly history of being used against fellow members of the LGBT community. It pains me to watch the community to which I've dedicated so much of my life engage in such self-destructive behavior. Nonetheless, I am prepared to use legal channels, if necessary, to defend my reputation from these libelous accusations."

However, others that worked with him on the project appear to have given the stories told on the website at least some credence (tinyurl.com/MMnet23u), which makes it harder for people to claim this is some kind of smear campaign. It's this inherent implication that people have ignored allegation before that appears to have driven the wish for a new board, in the hope that they are also a new slate.

.AVWhy..?

This section of the magazine is based on things we've seen and enjoyed while toddling around the internet (affectionately referred to in these parts as 'being at work') and want to share with you. Sometimes they're funny, sometimes not so much; sometimes they contain footage of real events. But increasingly the videos we come across are created solely with the intention of becoming viral rather than simply being placed online and found organically. Whether it be the endless hours of GoPro footage showing people doing amazingly brave/stupid things for clicks, or the parody songs of the Holderness family, these bite-size pieces of video compete for our attention almost constantly these days. They're a business in their own right, as the fortunes generated by some YouTube stars have illustrated. So it's little surprise to find that companies have been creating clips for just that purpose – take Australians The Woolshed, for example, and their so-called Viral Project (tinyurl.com/MMnet23v), a series of films created to garner as many headlines and as much coverage as possible, presumably to promote their own skills.



Caption Competition



"...And we will put the heat sink in this building."

Issue 1421 featured these likely lads as the stars of our Caption Competition. Here are our favourites...

- **johnbarry:** "I tell you Mr Gates, this will work in the future, maybe pass it down to Bill."
- **JayCeeDee:** "Okay, Mr Hoover – that's Al Capone's tax returns for the last three years. Would you like me to burn them?"
- **doctoryorkie:** "And here is the 35th draft of the proposal for a paperless office."
- **ricedg:** "And this is what we call a trade deal."
- **GP:** "As you know, bakelite has sharp edges when it breaks, so we're going with asbestos for the new line of baby rattles. Much safer all round!"
- **BullStuff:** "There is no lead in my pencil!" ... "Never mind old chap, it comes to us all one day!"
- **PlaneMan:** "Why did you put glue on the end and tip of the pencil?"
- **blacklion1725:** "Don't worry Neville, just sign – he's promised not to invade anywhere else."
- **Dwynnehugh:** "You know, this bit about Article 50 is very badly worded."
- **Peter Hopkins:** "With the state of your tie, just be thankful colour photography won't be invented for a few years yet."
- **Thomas Turnbull:** "I reckon that once I've joined all the dots it'll be a duck."

Thanks for all your entries. This week's winner is doctoryorkie, with "...And we will put the heat sink in this building." Brilliant!

If you have a caption for this picture, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk), or email us via editorial@micromart.co.uk, remembering to add the issue number to the email subject line.



Millions Of Android Handsets Hit With Malware

China's crisis, mostly

According to security researchers at Checkpoint, up to ten million Android smartphones have been infected by malware.

Researchers took note of the malware, named Hummingbird, which generates fake clicks

for adverts – making around \$300,000 for the malware's creators. Checkpoint is in no doubt that it is a nasty old piece of code but, thankfully for we UK residents, most of the Android handsets affected by this were found in China, according to reports.

Elder Scrolls Goes For Gold

Post-summer treat for gamers

Those lovely people at Bethesda have announced that a *Gold Edition* of *The Elder Scrolls Online* will be made available to gamers on September 9th.

Allowing new players the chance to gain immediate access to the whole story, the *Gold Edition* will include *The Elder Scrolls Online* core game content and four DLC Game Packs featuring new quests, locations, and abilities, including *Imperial City*, *Orsinium*, *Thieves Guild*, *Dark Brotherhood*.

This will be an all-in-one treat for new players to the award-winning MMORPG. If you're intrigued, you can read more on the game at www.elderscrollsonline.com.



Snippets!

Hoverboards Recalled

Wannabe Marty McFlys be warned. Over half a million hoverboards have been recalled in the US because of risk of explosion. The recall was issued by the Consumer Product Safety Commission, which said that the lithium-ion battery packs on the boards could overheat, which is obviously a fire risk. The Commission also said that there have been at least 99 such incidents, so this is a very real safety worry.

Michael J Fox may have made them look cool, but that's Hollywood for you, folks. These hoverboards are actually just a bit rubbish, right?

Seagate Job Cuts

Storage specialist Seagate is slicing its staff by 14% across Europe, Asia, the Americas and the Middle East. That amounts to 6,500 employees, and it's all happening over the next 12 months. Why all the cuts? Well, it's clearly down to the desktop PC market not being anywhere near as strong as it used to be, thus having a knock-on impact on drive demand. The cloud has a lot to answer for.

Sky Porn Filter Pledge

New customers to Sky's Broadband platform will now be serviced with the automatic installation of its pornographic content filter, Broadband Shield. Moreover, every existing broadband customer will also be contacted over the next few months and asked whether they wish to have Shield working or not – and if they don't respond, Shield will again be put in place automatically.

Sky has said that by being an automatic porn filter it "ensures a safer Internet experience for millions of homes", by which it claims that around two-thirds of households will use it.

This has been on the cards for a long time so Sky's decision should be no shock to anyone.

ViewSonic Ships New Screens

Prices to suit all budgets

We haven't heard from ViewSonic for a while so it was nice to hear that they've been hard at work readying some new screens for your delectation.

The launch of the VX76-SMHD and VX2778-SMHD series of multimedia displays means that you now have a bunch of options if you're looking to upgrade your desktop set-up any time soon. The VX76 series is available in three sizes (22, 24" and 27") and includes premium features including native Full HD 1080p and QHD 2560 x 1440 resolutions, frameless bezel plus ViewSonic's SuperClear IPS and PLS panel technology. The VX76 series is definitely the looker of the two options with a rather nice stand, as seen here – inspired by the Egyptian pyramids, according to the associated press release.

Both the VX76 series and VX2778-SMHD displays promise to be easier on the eyes with

Flicker-Free technology and a Blue Light filter alongside five preset user options for the best viewing experience. Costing from £129, there should be something here for anyone and these should be available to buy this month. The website for more details is www.viewsoniceurope.com/uk.



Pokémon Go Crime Committed In US

Robbers use game to ensnare victims

Horrible news from America as armed robbers reportedly used the *Pokémon Go* game to bring their victims to a trap in Missouri. Specifically, the robbery took place in a car park, where the robbers lured the unwitting victims using the game's beacon feature, before locating them using the app and going about their unpleasant business.

The police department in Missouri has since warned gamers via its Facebook page: "If you

use this app (or other similar type apps) or have children that do we ask you to please use caution when alerting strangers of your future location". In fairness to the chaps behind *Pokémon Go*, they also warn gamers to be aware of their location and what's around them during the game.

Since its launch the media has reported all sorts of problems relating to this app. Its release hasn't done Nintendo's bottom line any harm, though. Within two days of its launch, the company's market value had benefitted to the tune of \$7.5bn.

E-sports Player Signed By Manchester City

Club's first e-sports player

It is truly a sign of our times that one another of the English Premier League's top football clubs is now very much involved in the world of eSports. Manchester City has announced the signing of Kieran 'Kez' Brown as the football club's first ever e-sports player. Brown will represent Manchester City at competitive e-sports tournaments for FIFA, live streaming on Twitch and

making videos for the club's YouTube channel. E-sports is clearly seen as a potential money-spinner for Premier League clubs, and Manchester City isn't the first club to go down this road.

In May, West Ham United became the first UK football club to sign a professional eSports gamer to its ranks. The Hammers signed up Sean 'Dragonn' Allen – again to represent it in upcoming FIFA gaming tournaments.

Qualcomm Announces New Snapdragon

821 follows 820. That was quick

Qualcomm has announced another flagship mobile processor, and it's named it the Snapdragon 821. It's an update on the previous Snapdragon 820, unsurprisingly enough – a chip that can be found in many an Android handset. That means you can likely expect the 821 to offer advances in much the same vein as its predecessor.

Indeed, according to Qualcomm the Snapdragon 821 naturally builds on the technology from the 820 processor while offering a probably-not-to-be-sniffed-at 10% performance increase and a quad-core Kryo CPU running at 2.4GHz.

Expect these to debut in smartphones and mobile devices in the second half of the year as and when new devices appear to tempt us.

Amazon Prime Day – It's Quite Big, Actually

Boy, do we all love online shopping

It's only in its second year but Amazon's Prime Day's already become the sixth biggest online shopping day in the UK. That statistic comes from digital market intelligence outfit SimilarWeb, which looked at the 25 leading UK online retailers and found that it only sat behind the traditional holiday shopping days in terms of traffic levels during 2015.

Black Friday was predictably the day that saw the most traffic

– 52.9 million combined mobile and desktop visits – while Boxing Day, Thanksgiving, Christmas Day and Cyber Monday were behind that. Prime Day, however, came in ahead of Valentines Day with 29.1 million combined mobile and desktop visits for the UK's top 25 leading online retailers – of which Amazon gathered a healthy 10.5 million.

We await the day we find ourselves saying "Happy Amazon Prime Day!". Actually, no... That's never going to happen...

Telecommunications Companies Outline 5G Plans

Consortium looks to a bold new future

Twenty companies – including BT, Nokia, Orange and Vodafone – have signed up to a '5G Manifesto', which marks out what challenges and opportunities will be presented by a 5G infrastructure in Europe. The plan is a hefty document that commits to large-scale demonstrations of 5G by 2018, including its use in cars, and the commercial launch of 5G in at least one city in every EU country by 2020.

However, the flip side of those assurances is that the group want some assurances on regulation. Specifically, it calls for net neutrality rules to be lessened, stating that "The telecom industry warns that current net neutrality guidelines... create significant uncertainties around 5G return on investment. Investments are therefore likely to be delayed unless regulators take a positive stance on innovation and stick to it."

Hmmm... You get nothing for nothing, do you?

Aorus X3 Plus v5

The world's most powerful 13.9" laptop? We'll see...

DETAILS

- Price: £1900
- Manufacturer: Aorus
- Website: goo.gl/cdsCHi
- Requirements: Windows account

Aorus is a growing gaming range from Gigabyte, featuring keyboards, mice, other accessories and a selection of impressive laptops. Chief among the laptops is the X3 Plus v5, labelled as the 'World's most powerful 13.9" laptop', which Aorus has packed with every conceivable gaming component you could think of.

Inside you'll find an Intel i7-6700HQ processor running at 2.6GHz, with a turbo of 3.5GHz, an impressive 16GB of DDR4 2133MHz memory, a Samsung SM951 512GB M.2 SSD and Windows 10 Home 64-bit.

Graphics come courtesy of the built-in Intel 530HD, and, to drive the gaming side of things, an Nvidia GTX970M with 6GB of GDDR5 memory, which manages to keep up with most, if not all, of the current triple-A titles available at a high resolution. Be warned, though, even with this decent 970M installed, 4K gaming is going to be a tough ride with low frame-rates.

Connectivity is good, with a single USB Type-C port, two USB 3.0 and a further single USB 2.0 port. There's also HDMI 2.0, mini-DisplayPort, gigabit Ethernet, an SD card reader, audio ports, Bluetooth 4.1 and 802.11ac wi-fi.

The 13.9" IGZO QHD+ display does an excellent job, and with a maximum resolution of 3200



▲ The Aorus X3 Plus v5 is a spectacular gaming laptop



▲ Not only does it look good, but the benchmarks are equally impressive

x 1800, it's sharp and colourful. The quality is really superb: 4K videos look stunning and higher-resolution gaming is remarkably good too. The only problems we have with it are the odd Windows scaling features that tend to mess up third-party programs and other non-Windows views.

In terms of benchmarks, the Aorus X3 Plus v5 did extremely well indeed. The 3DMark 11 overall score of 9,412 is better than most gaming desktops

we've used in the past. And while that number is below the recommended VR specification, we tested it with an HTC Vive, and it worked perfectly well.

Furthermore, the SSD benchmark, using ATTO, managed a write speed of 1.3GB per second and a read speed of 1.6GB per second on the 8192KB test, and 339MB per second write and 366MB per second read for the 4KB test. All of these are pretty impressive numbers to further

the claim of the world's most powerful 13.9" laptop.

The build quality of the X3 Plus v5 is generally good throughout, with an all-aluminium chassis, although there was some creaking from the display hinge. The scissor-switch keyboard is well laid out, and comfortable, with a large Aorus logo imprinted touchpad that's accurate and responsive. There are also six macro keys along the left-hand side of the keyboard, which can be configured into groups within the Aorus X3 software for further gaming tweaking. Another interesting feature is the USB charging port built into the power brick, for you to charge your phone or tablet without taking up another power outlet. It's a little addition but one that sets it aside from the competition.

However, all this comes at a price: £1,900 to be exact. That does feel a little steep, but when you take into account the specification and the size of the X3 Plus v5, you can begin to forgive the high price and instead appreciate this as one of the most powerful gaming laptops available.

mm David Hayward

An amazingly powerful, ultra-small gaming laptop



Corsair Neutron XTi Series 480GB

Corsair brings more RAM to its XTi SSD party

DETAILS

- Price: £184.99
- Manufacturer: Corsair
- Website: goo.gl/jgNOLs
- Requirements: System that can accept 2.5" SATA drives
- Part no. CSSD-N480GBXTI

Corsair has made some decent mainstream SSD drives over the past few years, including the Force LS, LX and LE series. For those wanting more performance, it offered the Neutron XT, a design it's now superseded with the new Neutron XTi.

What's fascinating about this product is that Corsair is effectively mirroring what all other SSD makers have chosen to do: cost reduction through simplification. The Neutron XTi inverts that trend by enhancing cache operations with more DRAM buffering the NAND memory, resulting in even higher performance. The 480GB model has 1GB of DDR3 attached, and

the 960GB a whopping 2GB.

To make best use of those changes, Corsair employed the Phision's PS3110-S10-X quad-core eight-channel controller – probably the best third-party design around. While this is the same controller it used previously, the XT used the Toshiba A19nm MLC NAND,

whereas the XTi uses Toshiba 15nm MLC flash instead.

How much better this MLC flash is than Toshiba's previous modules is underlined by the jump in total bytes written (TBW). The XT managed 124TB TBW on all drive sizes, whereas the XTi offers the same at 240GB, 320TB for the 480GB model and 640TB for the 960GB model.

If you reasonably consider that writing 30GB of data a day is more than most computers do if they're used for a full working day, then based on a five-day working week, the 480GB drive would easily last four to five years, and the 960GB model twice that.

With the reliability box well ticked, it was important that the investment in extra DRAM actually brought home speed improvements.

I can report that performance is probably the best I've seen on a SATA-3 connected drive, with the 480GB model delivering almost exactly what Corsair states. A

read speed of 558.7MB/s and write of 544.9MB/s put this on the ceiling for SATA-3, as there is no more bandwidth in this subsystem to go any quicker.

With QD32 read IOPS topping 100K and writes 90K, this SSD is also excellent at handling heavy transactional workloads.

The only caveat to these numbers is that M.2 PCIe drives will go that much faster if you're able to exploit that technology and interface.

The price I've quoted is Corsair's own, so you can knock about £25 off that if you're prepared to hunt online. That's cheaper than the Samsung 850 PRO 512GB SATA by around £30, though you get slightly more total capacity in that product.

Those who are looking for great performance and reliability will be obviously interested in the Neutron XTi, as it exploits the full scope of SATA-3. I just hope that less informed buyers don't pass it over for budget drives with zero DRAM in them purely in reaction to the headline cost. They'd be missing out on what is a significant improvement over all the mainstream SSD offerings.

mm Mark Pickavance

Key Features

- Form factor: 7mm height, 2.5".
- Interface type: SATA 6Gbps (SATA 3).
- Max sequential read (ATTO): Up to 560MB/s.
- Max sequential write (ATTO): Up to 540MB/s.
- Max sequential read (CDM): Up to 540MB/s.
- Max sequential write (CDM): Up to 525MB/s.
- Max random read QD32 (IOMeter): 100K IOPS.
- Max random write QD32 (IOMeter): 90K IOPS.
- DEVSLP: 3.0mW.
- Endurance: 320TBW.
- Operating temperature: 0°C to +70°C.
- Storage temperature: -40°C to +85°C.
- Operating humidity: 90% RH (40° C).
- Storage humidity: 93% RH (40° C).
- Shock: 500G.
- Vibration: 20Hz~80Hz/1.52mm, 80Hz~2000Hz/20G.

Blazingly fast SSD with great reliability to boot



Asus Asustor AS3204T NAS

Asus takes on Synology with a powerful four-drive NAS box

DETAILS

- Price: £388.99
- Manufacturer: Asus
- Website: www.asus.co.uk
- Requirements: Wired network

I haven't reviewed any NAS (network attached storage) products from Asus before, and I'll admit to being moderately shocked as to how many of them it makes. The very latest are the two-drive Asustor AS3202T and its four-bay AS3204T brother, reviewed here.

In terms of general construction and styling, Asus has avoided anything radical with these products. These are metal boxes that slide apart to mount SATA 3.5" or 2.5" drives inside without the need for hand tools.

Also familiar is the configuration method: using a PC-based initialisation, the latest version of its NAS OS is transferred to the system and the drives are then formatted in the desired layout. Anyone who's used a Synology NAS box will recognise these hoops,

Key Features

- 4 bay NAS
- 2GB DDR3L Memory
- Intel Celeron Quad-Core
- GbE LAN x1
- 3x USB 3.0 Ports
- WoL, System Sleep Mode
- AES-NI hardware encryption
- 3 Year Warranty
- Size (HWD): 165 x 164 x 218 mm
- Weight: 1.6 kg

because they'll have jumped through them before.

So where does the AS3204T start to plough its own furrow?

Those began to surface as I ran through the specification, because in terms of NAS technology for home and small business, the AS3204T is an exceptionally powerful platform.

Instead of ARM technology front and centre, this NAS box is really a PC, built around a quad-core Celeron 1.60GHz CPU (Turbo to 2.24 GHz) and 2GB of DDR3 RAM. With that level of grunt available, Asus

was able to make all three USB ports 3.0 spec and make this system do substantially more than serve files.

It offers hardware encryption provided by an Intel AES-NI encryption engine, hardware video transcoding and even iSCSI virtualisation. It also has one feature that Synology has offered previously on the DS415play and the DS71: an HDMI port for directly outputting media to a TV or monitor.

As the hardware transcoding engine supports H.264 (AVC), MPEG-4 Part 2, MPEG-2 and

VC-1, once KODI is installed to the app selection, then the AS3204T becomes judge, jury and executioner for media duties. The playback can be controlled either with an infrared remote that Asus includes, or using iOS or Android apps on a suitable phone or tablet.

I have reservations about using a NAS box in this way, but that it can work without the need for a media client could be very useful under certain circumstances.

Where I've no such problems is in respect of the





“ There aren’t many
niches that the AS3204T
can’t easily occupy ”

application suite that you can install on this hardware, as it includes tons of tools and almost all the key ones anyone running a NAS box might reasonably want or expect.

In the last couple of years, we’ve seen Western Digital and Seagate both come into this sector with glossy-looking NAS solutions with virtually no apps, and thankfully Asus hasn’t repeated those mistakes.

When you combine the amount of power in this unit with the flexibility that the apps provide, then there aren’t many niches that the AS3204T can’t easily occupy.

The performance is excellent, effectively topping out what you can push over a single gigabit port. That begs the obvious question of why Asus didn’t give it two for channel-bonding glory, but I



presume it wants to keep that for an even higher-spec model.

The only equipment that would be even more flexible would be a PC, and that’s the caveat for this reviewer. At this price, you could buy a PC and put your own NAS on it, and you’d also have something that could double as an actual computer. However, part of that argument is undermined by the ability to add a mouse and keyboard to the system and run Chrome (or Chromium) from the Kobi interface.

One of the available apps is also LibreOffice, so you’re not forced to go entirely over to the Chrome app selection.

That this hardware can do that is great, but due to the imperative of being a file and media server, this will never equate to the experience of an actual Windows PC. And when you consider that a small Zoostorm desktop PC built around an AMD APU with 8GB of RAM and a 1TB hard drive installed costs about 60% of this price, I have to question the logic of going in this direction.

I’d accept that the purpose of this hardware is to configure and forget, but all systems need to be maintained and tracked unless you’re a fan of utter chaos.

The strongest side of the Asustor equation is that it’s engaged Synology head-to-head and made its software feature set comparable. I don’t think this box is as nicely made as Synology’s similarly priced designs, but arguably what’s more important is the software platform it’s built, rather than how exotic the enclosure is.

More of an issue is the pricing in what is a very sensitive sector. While I salute Asus’s endeavours, confronting the market leader in its own back yard will most likely require more competitive pricing than the AS3204T currently offers.

mm Mark Pickavance

Feature packed but needs a bit of polish



SteelSeries Apex M500 Keyboard

Is it time for the fabled SteelSeries 6GV2 to finally step aside?

DETAILS

- Price: £94.99
- Manufacturer: SteelSeries
- Website: steelseries.com
- Requirements: Windows 7 PC or later, Apple Mac OSX 10.8 or later



Very few people use their computer exclusively for one purpose. Even the most hardened gamers need to surf the internet or write and email occasionally on their system, even if it isn't the reason they bought or built it. Because of that, having an input device that can be used in anger for both gaming and business can be critical, because nobody wants to have two keyboards or mice and swap them around.

Until now, my personal solution to the dichotomy of keyboard use has been the SteelSeries 6GV2, a keyboard that can handle the abuse of keying some half a million words a year, and which is also rather good when I'm in the mood to play.

In the four years I've had one of these, I've polished the spacebar to a gloss finish, and my vowels are slowly

fading from view. It's patently time for a change, and right on cue SteelSeries has just launched the Apex M500!

Sitting the new M500 next to the 6GV2, it is striking how relatively little SteelSeries has altered on this design. There was very little wrong with this design beforehand, so it would seem odd to radically redesign it now.

The M500 has exactly the same number of keys in an almost identical layout, and it also still uses the incredibly precise Cherry MX switches. In the case of the M500, these are the Cherry MX Red, whereas the 6GV2 did



offer MX Red and MX Black options. The MX Red switch is good for gaming and typing, so most people will be happy.

The other changes are mostly very subtle, like the edge lip on the 6GV2 that's now become a bevel what won't easily retain misplaced toast crumbs.

It's also about 12mm narrower, with most of that space being squeezed out of the gaps between the insert/home and direction arrow clusters and the main keyboard and numeric pad either side of them. The only significant change to the QWERTY zone is that the '#'

key is now on the second row, moved up from the bottom, allowing for a reshaped Return and a wider right shift.

That I was able to transition immediately from the old to the new without any significant problems demonstrated to me that they didn't alter anything critical for fans of the older design.

I noticed that SteelSeries has moved the media controls to different function keys, though I never used them, and it's added a light to indicate when Windows key is locked for gaming.

Underneath, it's created a nice channel system for

Features

- Cherry MX red mechanical gaming switches.
- Individual blue LED illumination.
- 100% programmable with SteelSeries Engine.
- Full anti-ghosting with 104 key rollover.
- Standard key layout.
- Reinforced steel back plate.
- Under board cable management.
- Interactive SteelSeries key.



directing where the cable comes out at the back, and as you might reasonably expect, it's all been built to withstand prolonged abuse at the hands of energy-drink-fuelled gamers.

Being honest, if this were built any tougher, it could double as a cricket bat.

And if those features weren't enough, SteelSeries has also given the Apex M500 some subtle key backlighting. It's not anything like the system it put in the Apex M800 or 350, where you get technicolour explosions under your fingers.

The LEDs are blue, and you can adjust their brightness, revealing that this is a nod to low light use and not the lightbulb festooned fairground rides of my childhood.

The exotic face of this design is in the SteelSeries Engine Software, where you can create incredibly detailed

game profiles and key macros to your heart's content.

SteelSeries also claims you can do on-the-fly macros, though the process for

design is exclusively USB out of the box.

In all other respects, the Apex M500 is the replacement for the 6GV2

excessive, and considering how long the Apex M500 should last, it's probably a bargain.

If you have an input problem, if no one else can help, and if you can find one to buy, maybe you should get the SteelSeries Apex M500.

mm Mark Pickavance

“ If this were built any tougher, it could double as a cricket bat ”

doing this does require some work with the Engine3 tools beforehand. This could be better if it dedicated keys to macro functionality, but I can see why it would resist adding special keys and messing with its well-honed layout further.

The only change that I might take issue with in the M500 is that where SteelSeries provided a PS/2 adapter on the 6GV2, this

that was required, avoiding the excesses of some high-end designs and instead focusing entirely on what you really need during heated e-sport engagements.

There's a pureness of purpose here that many companies could learn from in designing their products and revamping their ranges.

The icing on this particular cake is a price that's not

A keyboard for pure gamers and dedicated typists alike



BenQ EW2775ZH

Looking after your eyes and getting a great frameless view of the desktop

DETAILS

- Price: ~£170
- Manufacturer: BenQ
- Website: goo.gl/X2vf5s
- Requirements: HDMI or VGA outputs

While necessary to some degree, manufacturers often ruin the stylish good looks of their monitors by using an extraordinarily thick lump of plastic around the edges of the screen. That's not the case with this new display from BenQ, though.

The main draw of the BenQ EW2775ZH is its near bezel-less sides and top. Not only does it look remarkable, but it fools you into thinking the screen size is bigger than it actually is. Not that there's anything small about the 27" AMVA LED to begin with, and the full HD display with a dynamic contrast ratio of 20,000,000:1 produces a more than adequate image.

Viewing angles are a good 178° on both the horizontal and the vertical, and because this is a BenQ monitor, it features extra viewing technology in the form of a flicker-free backlight, low blue light modes and good control over the screen thanks to the BenQ Eye Care features.

Connectivity is good too, with a pair of HDMI ports, VGA, line-in and a headphone port. There's no DisplayPort or DVI, though, so you'll need some kind of conversion along the way if your setup can't directly cope with the lack of these ports.

Returning to the style and aesthetics of the monitor, the



▲ The BenQ EW2775ZH is a stylish monitor, with the usual BenQ quality eye-care technology



▲ The frameless design though is a good touch

bezel (what little there is of it) around the sides and top of the screen measures just 2mm, with the bottom portion of the monitor measuring 20mm, displaying the BenQ name and a BI (Brightness Intelligence) button, which automatically adjusts the levels to help reduce eye strain. It's easily one

of the thinnest frames we've ever come across on a monitor, and if you place two of these together in a dual desktop setup the near seamless effect is simply wonderful.

The quality of the image displayed is as good as you would expect from a good modern AMVA LED monitor

and from a company that excels in producing all-round good monitors. It's clear, sharp and produces good depth of colour. There's an equally good production of very bright and very dark areas, with the high gamma helping to separate the two with an astonishingly good degree. As we said earlier, the thin surround makes the monitor 'feel' surprisingly bigger than it actually is. An optical illusion it may be, but it's certainly a good one.

Games, films, photo viewing, editing and video editing duties were all excellent, especially the brighter elements, where there's often some graininess from other VA panels, but thankfully not in this case.

The BenQ EW2775ZH is a great full HD monitor. The screen is good and the thin bezel makes for a far more stylish monitor than we're generally used to using. It's also not too badly priced either, at around £170. The only downside is the lack of DisplayPort and DVI, which may ultimately affect your decision to buy.

mm David Hayward

A good frameless monitor, with great eye-care technology



LandscapePro

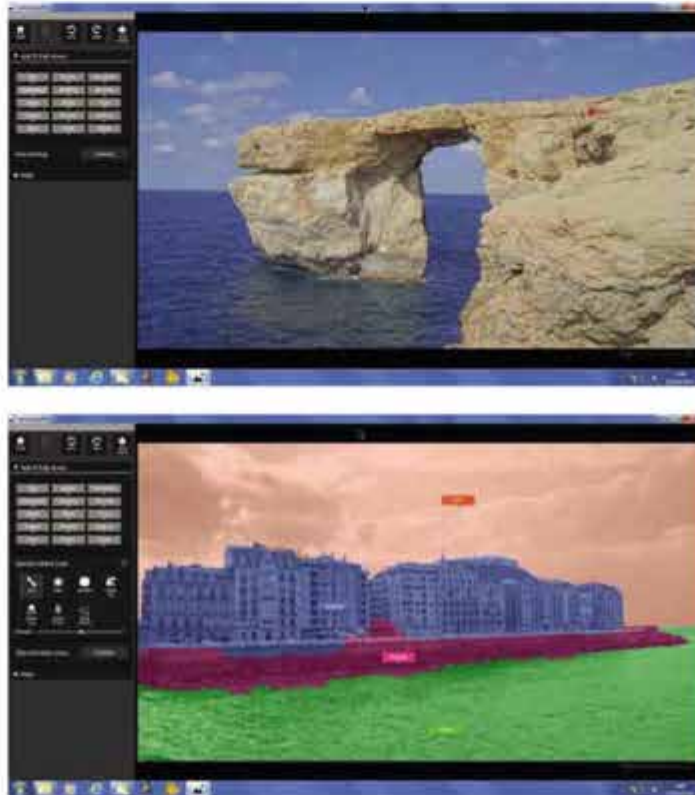
Michael runs through the features of this intelligent landscape editing tool

DETAILS

- Price: £49.95
- Manufacturer: Anthropics Technology
- Website: www.anthropics.com
- Requirements: Windows XP or later / Mac iOS 10.7 or later

Following on from its Portrait Pro product, Anthropics Technology has moved from the foreground to the background with its new LandscapePro offering. Available in either Standard or Studio versions, LandscapePro comes with the claim of being the industry's first intelligent landscape photo editing package. The Studio version of the product is available as a stand-alone product or a plug-in for Photoshop, Lightroom or Photoshop Elements. My review is based on the stand-alone Studio edition.

In true Anthropics fashion, this program combines its title screen with its initial list of options. The LandscapePro's opening interface allows you to load one of your own images, select from a scrollable roll of sample images and a link to a web based video that demonstrates the main elements of the program's functionality, plus a useful Help



feature. Various settings can be adjusted as you decide whether to display tips and send anonymous data to Anthropics regarding the use of the product. There is also an option to speed up matters by having 16-bit images converted into 8-bit code during the work process and then have it converted back to 16-bit when the file is eventually saved.

The product, as befits its title, has been designed to work with landscapes that require editing in some way. As with all types of images, landscape scenes consist of various elements that can be labelled. In the case of landscapes, this program presents the user with a palette of labels. You can select from these labels, which can be used to tag elements of the image. These labels cover areas such

as Sky, Ground, Animal, Mountain and Person to mention just a few.

Each label, which can be placed by the standard drag-and-drop method, will colour code the selected area. Generally the software makes a reasonable stab at marking the appropriate areas, but sometimes you'll need to make minor adjustments using the mouse as your tool. For really small objects that require selection or adjustment, you're supplied with a specific tool for the purpose, plus you can zoom into the image by using the mouse wheel. With labels in position, marking their territories, you can then make use of various preset views from scrollable thumbnail images of possible altered views.

Of course, you're not restricted to these preset views.

You can take a more personalised approach by adjusting features such as contrast, hi/lo key, fill light, vibrance and saturation using slider bars. If you've opted for the appropriate tips option from the Settings feature, then pop-up tips, with suggestions as to how to proceed, will appear.

Often with images based on landscapes, there are certain areas that might need particular attention. The horizon is one such area, and you've been given a tool to adjust this joining of the sky and land. You also have control over a virtual sun that gives you the power to change lighting conditions by altering the source of the illumination flooding the scene.

Other controls enable you to add depth to a scene, plus adjust colours depending on their distance from the camera when the scene was captured. At any time you can quickly call up and be reminded of the original image, and single step backwards and forwards through the individual adjustment that have been made using an undo/redo feature.

mm Michael Fereday

Useful software for making the camera lie



GROUP TEST

Budget SSDs

It wasn't that long ago that 8GB SSDs would have cost the earth, but they represented the future of computing, with fast read and write speeds.

These days, the prices have dropped significantly, and the capacities are considerably more than a mere 8GB. This week, we're testing six drives that cost less than £50.

Budget SSDs

Kingston SSDNow V300 120GB

DETAILS

- Price: £34.98
- Manufacturer: Kingston
- Website: goo.gl/ivEyWa
- Requirements: SATA-3 for best results, space for a 2.5" drive

This 120GB drive falls under Kingston's V300 SSDNow range. It has an older LSI

SandForce 2281 controller, which has been customised for Kingston and uses the Toshiba-built 19nm Toggle NAND flash.

It measures 69.8 x 100 x 7mm, weighs 86g and comes in capacities ranging from just 60GB up to 480GB – although you may be hard pressed to find a 60GB model these days.

The Sandforce controller may be considered as old technology these days, especially with more advanced Marvell offerings giving us higher capacities at better speeds, but it's still a pretty effective workhorse. In this case, the drive offers a one million hour MTBF and a three-year Kingston warranty, which is more than enough for most average systems.

The SandForce controller also gets some stick when it comes to performance. In our tests, the Kingston SSDNow V300 managed 556MB/s in the 8192KB sequential read tests and 531MB/s in the same write test. The 4KB tests, where the SandForce technology has often left a lot to be desired, managed 160MB/s reading and 254MB/s writing. The Kingston V300 is pretty fast,



▲ *The Kingston SSDNow V300 120GB is a great, well balanced drive*

► *It's quick and has enough capacity for most users*

then, and will no doubt keep most home users and enthusiasts quite happy.

Kingston advertises this model as a more affordable way to get high-end speeds, with extra testimonials from people from various walks of life and a stark '10X Faster' label across the packaging. It's certainly fast enough for most users' systems, and it makes for a fine system drive.

Power consumption on this drive is rated at 0.6W when idle, increasing to 1.4W when reading and 2.05W when writing. Considering it's virtually impossible to tell exactly what an operating is doing most of the time (even when you think it's solely writing there's plenty of reading going on), we can guess that the overall maximum power usage is upwards of 2W when in full use.

Having said all that, the Kingston SSDNow V300 still represents an fast and cost effective solution to upgrade



from an older hard drive. It's definitely more than capable of speeding a system up and lessening the power use over time.

The Kingston SSDNow V300 120GB is a good enough SSD for most users. It only costs just £35, and it's fast enough for desktop users who don't do too much gaming. However, if you want faster speeds and more capacity, and you're planning on sticking to the Kingston range of SSDs, then the HyperX 3K models will be the ones for you.



Adata Premier Pro SP600 64GB

DETAILS

- Price: £30
- Manufacturer: Adata
- Website: goo.gl/LnwGqs
- Requirements: SATA-3 for best results, space for a 2.5" drive

This particular drive from Adata is at the lower end of what's available from the company, and it will most likely be phased out within the next six months or so in favour of something else. For the time being, though, it's readily available and worth considering if you're not after a top-of-the-range SSD.

The Premier Pro SP600 comes in various capacities from 32GB up to 512GB, but the version we have on test here is the 64GB model. Although not a huge amount of space, it's enough for a Windows installation and the usual set of office programs and so on.

The JMicron JMF661 SATA-3 controller is starting to look its age now, having been released a little over four years ago – an absolute age in technology. But the MLC NAND flash memory is up to scratch, although the throughput from the controller doesn't really bring out the best that the memory has to offer.

Other features of the Adata Premier Pro SP600 include ECC reco, an MTBF of a million hours, 1500G shock resistance and a reasonably low average power consumption of 0.35W or 0.14W when in a hibernate or sleep mode. Interestingly, Adata has also stated that the maximum operating altitude

▲ *The Adata Premier Pro SP600 is certainly inexpensive*

for the SP600 is 12,000 metres – just in case you ever find yourself seven and a half miles off sea level.

We didn't really expect something wonderful from

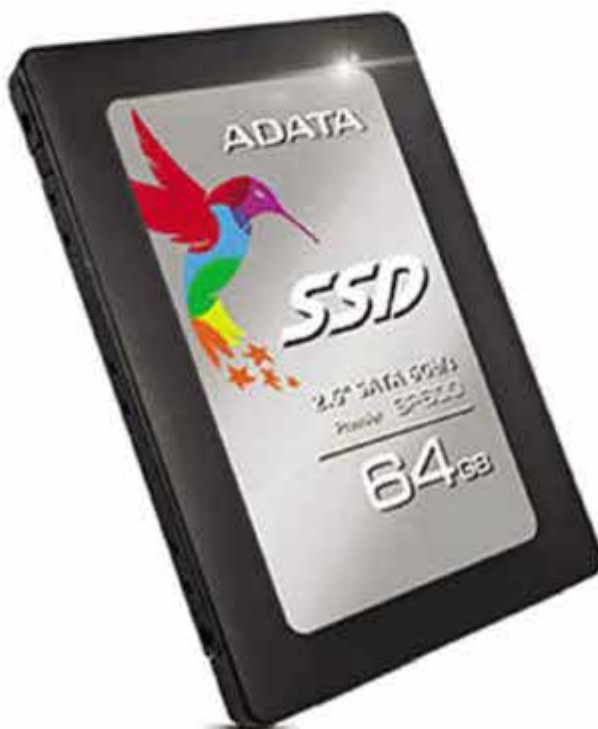
terrible 85MB/s write. Likewise, for the 4KB test the 194MB/s read speed was reasonable, but the 84MB write again was extremely poor. In fact, the write tests

“ It isn't going to lift your PC into the higher end of the benchmark league tables ”

the performance benchmarks, since this is just a 64GB £30 pound SSD, but we were quite shocked at how bad the write speeds were. In the ATTO 8192KB test it reached 566MB/s read and a rather

barely went above the 85MB/s mark throughout and only dropped to 83MB/s.

Looking at the official specification for the SP600, though, the 85MB/s write was actually an improvement, with



▲ *Unfortunately, it's only 64GB and not fast when it comes to writes*

Adata stating that the drive has a write speed of up to 70MB/s.

Needless to say, the Adata Premier Pro SP600 isn't going to lift your PC into the higher end of the benchmark league tables. On the other hand, it's perfectly adequate many users. Windows will undoubtedly boot quicker and your PC will perform better than if you had a mechanical drive – and all for just £30 too. But if you want better write speeds and certainly more capacity, then you're better off looking elsewhere.



Budget SSDs

Toshiba Q300 120GB

DETAILS

- Price: £34
- Manufacturer: Toshiba
- Website: goo.gl/6A36nl
- Requirements: SATA-3 for best results, space for a 2.5" drive

When Toshiba purchased the OCZ brand a couple of years ago, the first product to come from the newly marketed name was the OCZ Trion, an SSD that failed to excite the media at the time. Roughly a year later, Toshiba released the Q300 range of SSDs, with capacities from 120GB through to 960GB. However, it's pretty much the same drive as the Trion.

The 120GB Q300 is a single-layer TLC NAND memory drive using a flagging Toshiba TC58NC1000 SATA-3 controller. To help compensate for the non-multi-layer memory and not-so good controller, though, Toshiba has introduced some third-level technology in the form of Adaptive Size SLC Write Cache Technology.



▲ The Toshiba Q300 may not have endeared itself to many users



▲ It's not all that bad

Other features include TRIM support, SMART support, garbage collection, a typical power consumption of 3.6W dropping to 0.3W when in sleep mode, and an MTBF of 1.5 million hours.

especially with the 8192KB test, but the Q300 instead surprised us with a decent number. This we imagine is thanks to the write caching technology, since the mixture of TLC memory and that

model and about a pound cheaper than the Kingston SSD. While better than the Adata in terms of speed and capacity, we think it's better to pay that extra pound for an overall faster and better constructed drive.

Don't get us wrong, the Toshiba Q300 120GB is a good SSD, and it'll serve you well. But it's worth checking out the competition before committing to a purchase.

“ The Toshiba Q300 120GB a good SSD, and it'll serve you well ”

As for benchmarks, the Q300 performed reasonably well despite its poorer controller and lack of multi-layer memory. The read speeds recorded by ATTO for the 8192KB test were 563MB/s, while the write speed was 405MB/s. The 4KB test revealed both a read and write speed of 217MB/s

Admittedly, we were expecting lower write speeds,

particular controller are known for delivering lower write speeds.

While the Toshiba Q300 120GB may not be as fast as the Kingston V300 120GB SSD (except for the 4KB read test), it's certainly better than the Adata – and it's twice the capacity too.

The Q300 120GB is priced at £34, which makes it four pound higher than the Adata



Transcend MTS400 M.2 128GB

DETAILS

- Price: £41
- Manufacturer: Transcend
- Website: goo.gl/n84eW7
- Requirements: M.2, SATA 6Gbps connection on your motherboard

According to experts 2015 was the year of the M.2 SSD, with 2016 seeing it become the standard technology for new systems. An M.2 SSD represents the best storage technology currently available, with good capacities and fast performance – all from a stick that weighs no more than 8g and which is only around 50mm in length. What's not to like?

This remarkably compact SSD comes in four different capacities: 32GB, 64GB, 128GB and 256GB. It weighs around 4g and measures just 42 x 22 x 3.5mm.

Using Synchronous MLC NAND flash memory together with a Transcend-designed firmware and TS6500 controller (a rebranded SM2246EN), the MTS range focuses on supporting mobile platforms. The size of the MTS400, the use of Power Shield to help prevent data loss in the case of a sudden power outage and support for DevSleep that shuts down the SATA interface to help conserve battery life, all speak of a product that is designed for the new generation of ultra-thin notebooks, as well as tablets and phones.

As an extra feature, the MTS400 supports Intel Smart Response Technology, so you're able to configure the SSD to work as a memory



▲ The Transcend MTS400 M.2 SSD is a good, fast drive



▲ If you have an M.2 connection, then it's worth considering

along the lines of the Kingston SSD at least. Still, the MTS400 is by no means a slouch, and the smaller 4KB test speeds were excellent.

The Transcend MTS400 128GB M.2 SSD is where the future of storage lies, and for just £41, it's well worth investing in. However, you'll need to have an M.2 connection on your system, which will undoubtedly be missing from any motherboard that's older than a few years. That aside, if you do have such a connector, then it's worth considering one for your next system drive upgrade.

“Where the future of storage lies, and for just £41, it's well worth investing in”

cache between the hard drive and system memory. The advantage of this is greater storage with SSD-like performance, eliminating the bottleneck that is now a traditional spinner.

The benchmarks were certainly good, with a read benchmark at 8192KB of 563MB/s, while the write speed was 328MB/s. The smaller transfer sizes proved to

be good too: read speeds for the ATTO 4KB test were 301MB/s and writing at 4KB was 260MB/s.

The larger 8192KB read speeds were as we expected and more or less equal to what we've already seen from some of the other models on test. The higher write speed, though, wasn't as good as we'd hoped for, though, since we were expecting something

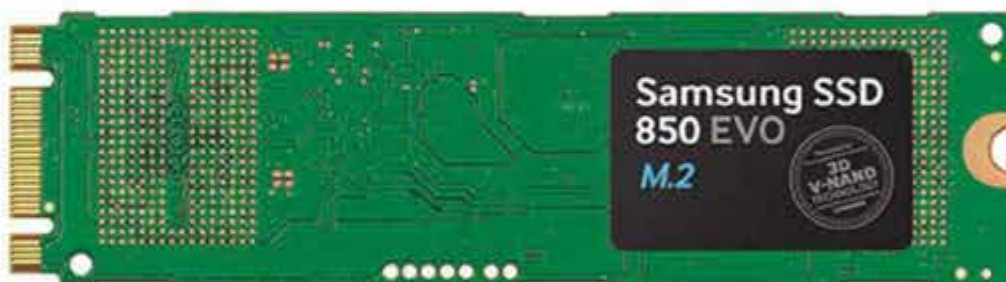


Budget SSDs

Samsung 120GB 850 EVO M.2 SSD

DETAILS

- Price: £42
- Manufacturer: Samsung
- Website: goo.gl/o2MP2V
- Requirements: M.2, SATA 6Gbps connection on your motherboard



▲ The Samsung 850 EVO SSD features some pretty impressive technology



▲ Its read and write speeds are excellent

Samsung has embraced the new M.2 form factor with a will, incorporating the company's 32-layer TLC 3D V-NAND technology as well as other features such as TurboWrite Technology and RAPID Mode.

The technology used is certainly quite interesting, but to begin with, this example from Samsung comes in three available capacities – 120GB, 250GB and 500GB – all of which use the Samsung MGX Controller.

The 850 EVO M.2 SSD measures 22 x 80 x 3.8mm and weighs around 6g, making it longer and heavier than the Transcend MTS400 M.2 SSD. The interface is SATA 6Gbps, compatible with SATA 3Gbps and 1.5Gbps connections, with an average power consumption of around 2.3W and a reliability of 1.5 million hours.

Further to the technology we mentioned earlier, the 3D V-NAND architecture is the company's cherry on the cake and something that impressed both critics and users when it was released. The process involves stacking 32 cell layers vertically, which will result in a higher density and, in theory, better performance within a smaller footprint.

The TurboWrite Technology claims to increase the read and write performance of the 850 EVO by up to twice

its current specification, resulting in a theoretical read speed of 540MB/s and an equally impressive write speed of 520MB/s.

And finally, RAPID Mode uses Samsung's Magician Software to utilise unused system RAM as a high speed cache, supporting up to 4GB cache on a PC with 16GB or more RAM.

In real-world terms, all this amounts to an SSD that sounds intriguing. Our ATTO benchmark certainly came back with some impressive numbers. The 8192KB transfer test recorded 550MB/s read, while the same size transfer recorded a write speed of 517MB/s. The smaller 4KB transfer managed 351MB/s

read and 302MB/s write, both of which are pretty good by SSD standards.

Interestingly, with the RAPID mode used in a system with 16GB of memory installed, the numbers didn't alter at all, even when run several times. In fact, on one occasion, they dropped ever so slightly. Benchmarks are odd things to pitch against a real-world scenario though, and in truth, Windows 10 was fast booting and ran perfectly well when installed on this drive.

As an upgraded system drive, the Samsung 120GB 850 EVO M.2 SSD is a fantastic choice. 120GB is enough for most users and more than enough for

Windows and its usual array of programs.

More tantalising, though, is the £42 price (and we found an ex-display model for slightly less). But as with the Transcend SSD, you'll need an M.2 connection on your motherboard.



SanDisk X400 128GB

DETAILS

- Price: £42
- Manufacturer: SanDisk
- Website: goo.gl/j9Xqli
- Requirements: M.2, SATA 6Gbps connection on your motherboard



▲ The SanDisk X400 has some pretty nifty caching and security features

Our third M.2 SSD is the entry-level model from the SanDisk X400 range, which includes capacities from 128GB up to an impressive 1TB in both M.2 and standard 2.5" forms.

This multi-layer TLC NAND (single-sided) memory device features a Marvell 88SS1074-BSW2 controller and measures 22 x 80 x 1.5mm while weighing 7g. Power consumption averages out at around 2.8W when active, dropping to 0.5W when idle, with an MTBF of 1.75 million hours.

Other features include TCG Opal 2.0 support, which offers security compatibility with third-party independent software vendors, should a more advanced secure encryption be necessary. As well as that, the X400 range has 256-bit AES Self-Encrypted Drive capabilities. You'll also find error correction in the form of DataGuard Client Technology, a five-year warranty and SanDisk's own nCache 2.0 technologies that will boost performance.

As for benchmarks, we recorded the SanDisk X400's ATTO 8192KB read speed as 540MB/s, with a write speed of 476MB/s. For the 4KB test, the read speed was 332MB/s while the write speed came back as 261MB/s. While not the fastest SSD, M.2 or



▲ The read and write speeds are excellent

“ It’s remarkably thin, has decent capacity and is fast enough ”

otherwise, in the group, the SanDisk X400 certainly held its own.

As with the other 128GB drives on test, there's enough space to comfortably fit Windows, the usual set of productivity programs and possibly a game or two.

Remarkably the SanDisk X400 128GB is priced the same as the Samsung 850 M.2, at just £42. While the Samsung model is slightly faster, the SanDisk X400 has

a lot more features, with newer technology being used too. Of course, a lot of that technology has gone into the encryption side of things, which is a business-led feature. While average users won't ever use 256-bit encryption or anything extended via any ISVs, it's something worth considering, especially if you plan to carry the SSD onto newer motherboards in the future.

The SanDisk X400 is a good SSD. It's remarkably thin, has decent capacity and is fast enough in its reads and writes to keep up with most users' needs. However, there are better models available for around the same price or less, so it's worth shopping around.





Samsung 120GB 850 EVO M.2 SSD

The Samsung 120GB 850 EVO proved to be the best M.2 SSD available from the three that we featured in the group. Also, the memory cache feature helps to cement its position here.

It's also really well priced, and you can probably pick it for a little less if you shop around.



Kingston SSDNow V300 120GB

For those who require a standard 2.5" SSD, you won't go far wrong with the Kingston SSDNow V300 120GB.

It offers enough capacity for most users, it's quick, and it'll work with systems older than a few years, which might well be lacking support for M.2.

How We Tested

Each SSD was installed in an MSI Z170A Gaming M5 motherboard, with two M.2 slots available, an Intel i5-6600K installed, 16GB of memory and the same Windows 10 fresh installation image transferred to each M.2 SSD, with ATTO used for the benchmarks.

	Kingston SSDNow V300 120GB	Adata Premier Pro SP600 64GB	Toshiba Q300 120GB	Transcend MTS400 128GB M.2	Samsung 120GB 850 EVO M.2	SanDisk X400 128GB M.2
Price	£34.98	£30	£34	£41	£42	£42
Form Factor	2.5" SSD	2.5" SSD	2.5" SSD	M.2	M.2	M.2
Capacity	120GB	64GB	120GB	128GB	120GB	128GB
8192KB ATTO Read Speed	556MB/s	506MB/s	563MB/s	563MB/s	550MB/s	540MB/s
8192KB ATTO Write Speed	531MB/s	85MB/s	405MB/s	328MB/s	517MB/s	476MB/s
4KB ATTO read Speed	160MB/s	194MB/s	217MB/s	301MB/s	351MB/s	332MB/s
4KB ATTO Write Speed	254MB/s	84MB/s	217MB/s	260MB/s	302MB/s	261MB/s

Top 5

Scrolling Beat-'em-ups

Jump, kick and punch your way to the other end of the street, with these classic fighting games

1 Final Fight

Produced by Capcom, *Final Fight* first appeared in arcades in 1989. This two-player beat-'em-up saw you taking on the ruthless Mad Gear gang, in order to rescue Jessica, the daughter of Metro City mayor Mike Haggar. Playing as Haggar, Cody (Jessica's boyfriend) or Guy (Cody's friend), it was a real blast, and its success led to home console versions on a variety of machines.

However, the SNES version, which came out in 1990, was the first one to be released, and it differed from the arcade in a number of ways. For a start, there was no two-player mode, and Guy was no longer in the game. This was thanks to hardware limitations, as was the reduction of simultaneous on-screen enemies from nine or ten down to two. A later version called *Final Fight Guy* saw this character swapped back in for Cody, but the two-player mode was still gone. All the same, it was a fun bit of street brawling action.

2 Teenage Mutant Ninja Turtles

Of course, when Konami's 1989 arcade smash was released in Europe, it was known as *Teenage Mutant Hero Turtles*, because the word 'ninja' (as opposed to the kicks and the punches) was deemed to be too violent for children.

The game was released in two versions. One was two-player only, offering players the choice of the four turtles, while the other had four joysticks, with each pre-assigned to one of the half-shell heroes.

Looking back, it wasn't a great game, but that didn't matter at the time. All players cared about was the four-player action and the fact you got to kick Shredder's Foot Soldiers in the face.

3 Double Dragon

Surely one of the most influential scrolling beat-'em-ups of all time, *Double Dragon* first graced arcades in 1987.

Designed by the now-defunct Technōs Japan, it saw brothers Billy and Jimmy Lee going on a mission to rescue Billy's lady, Marian, who had been kidnapped by the Black Warriors gang. Using a variety of weapons, including their fists and feet, the brothers took to the street to fight their way to Marian and to defeat the evil Shadow Boss.

Several home console ports followed, as well as a string of sequels. And in 2012, *Double Dragon Neon* was released, so if you're after a bit of retro-style gaming but with some modern flair, check it out.

4 Golden Axe

Although many of you will recall first playing *Golden Axe* on the Mega Drive, the Amiga or some other home system, it was released as a Sega arcade title first. Whatever

the case, it's a game that many will remember for its choice of playable characters: an axe-wielding dwarf, a male barbarian and an Amazonian lady. Presumably, *Golden Axe* land is very hot, because the latter two spent the entire game walking around in the underwear.

Fashion aside, it was also notable for its use of magic spells, which players powered up by repeatedly kicking sprites (as in elf-type creatures, rather than computer sprites - although technically, they were both). Plus you got to ride on weird chicken-headed dragon things called cockatrices. What more could you want?

5 Streets Of Rage

The only game in this list that didn't begin life as an arcade game, *Street of Rage* was a Sega game for the Mega Drive console. Like *Final Fight*, it was a two-player affair, offering a choice of three characters: Adam, Axel and Blaze. Each had his or her own strengths and weaknesses, but we suspect Blaze's tiny red skirt also made her a popular choice among teenage boys of the time.

Like all the other games here, the idea was to move from one side of the screen to the other, beating up bad guys along the way. And as fun as the fighting was, the thing that stays in our minds the most is the special attack: available once per player per level, it saw a police car arriving at the far left of the screen. An officer would then climb out of the car and fire an enormous gun that shot explosives everywhere, which somehow only hurt the enemies. And you thought today's American cops were trigger happy! **mm**



▲ Thankfully, law enforcement agencies the world over ignored *Streets of Rage's* idea of crowd control

The background of the entire page is a repeating pattern of small, stylized document icons. Each icon consists of a rectangle with a few horizontal lines inside, representing text. The icons are arranged in a grid-like fashion, slightly offset from each other, creating a textured effect.

Dealing With Duplicate Files

**Aaron Birch shows you how to cope
with this annoying problem**

Even with huge hard disks of over 1TB or 2TB, we all need to keep a close eye on our PC storage. Whereas we once thought we'd never use all of that impressive 1GB of space back in the foggy days of yesteryear, today it's all too easy to fill up even the largest of volumes. Music, movies, games, images and much more all contribute to a whole lot of data cluttering up our drives, so it's important to keep on top of your collection of files.

Now, it's usually not too difficult to keep tabs on data you want and need, and it's easy enough to have a browse through your installed programs to see if there's anything you want to remove. We can also use various backup methods to hive off a lot of data, storing such things as music and videos on external hard disks. This helps us keep our storage levels as optimal as possible, but there's one thing that's much harder to deal with and that's duplicate files.

“A good, organised method of storage can help greatly”

A more common problem than you may think, duplicate files can be a pain to deal with, and depending on the type of file in question, a lot of extra space can be taken up. Duplicate media files, for example, can quickly take up additional space, and because of their nature, they can be very hard to deal with. Often, duplicate files may be just that: duplicates in every sense. They may even have the same name. This can be easy enough to deal with, as a quick search will help show any duplicate results, but how do you tell which one you need and which is a duplicate? Even more difficult, some duplicate files may actually have different names. While they're called something different, the actual file contents may be the same and, therefore, unneeded.

These files are usually accrued by repeated downloads or added by program installations that include identical additional setup files (such as DirectX, .NET and other extra data). In fact, it's so easy to gather duplicate files, we could pretty much guarantee anyone reading this will have a collection of duplicates on their systems.

As you can imagine, this can lead to a very cluttered machine and it's easy for such files to use space that would be more useful elsewhere. If you're running an SSD, this is even more of a problem, and backups could also be increased in size, taking more time to run due to the increased amount of data.

Because of this, it can be important to keep tabs on your data and to take steps to both reduce the likelihood of duplicate files and to clean up any you already have on your PC. There are a couple of main ways to do this: pre-emptive care, and the identification and clean up of existing duplicates. Let's take a look.

Prevention

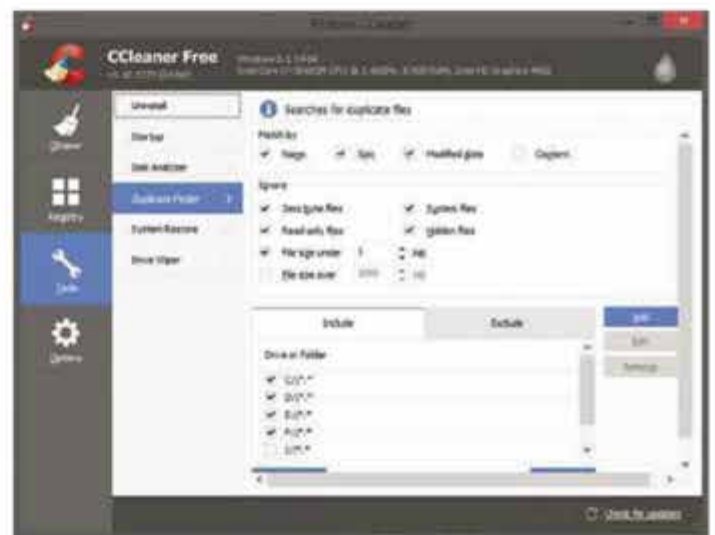
The best form of defence against viruses and malware is prevention. Stopping threats getting onto your PC in the first place is ideal. In a sense, the same applies to duplicate files. Although duplicate files rarely represent any serious threat like malware, stopping them getting onto your PC in the first place can be a major help. In the course of everyday use, a huge number of files could be copied and downloaded, and it's

impossible to manually keep tabs on them all, but you can use a bit of care and organisation to try to stay on top of things. Specifically, a good, organised method of storage can help greatly. If you have a lot of music, videos or other collections of data, try to keep everything in dedicated folders or drives. This way you can easily compare files, and any possible duplicates may be more easily highlighted.

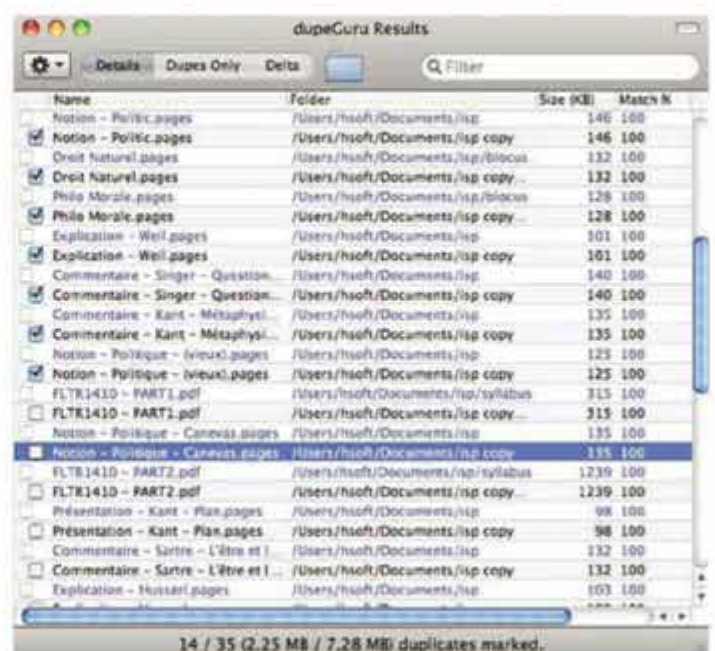
Make the most of Windows' filtering options within explorer. Using this, you can organise files by name, file size, date and so on. If you've got files that you suspect are duplicates, this can help, because things such as file size can be helpful when comparing two items. Of course, if a file is an actual duplicate copy, it should be suffixed by a number in parenthesis that represents the copy number, so will be easy to spot.

Professional Help

Manual tricks and careful monitoring of files can reduce the amount of duplicate files on your machine, but you'll probably



▲ Ccleaner has a handy duplicate file tool in its collection of functions



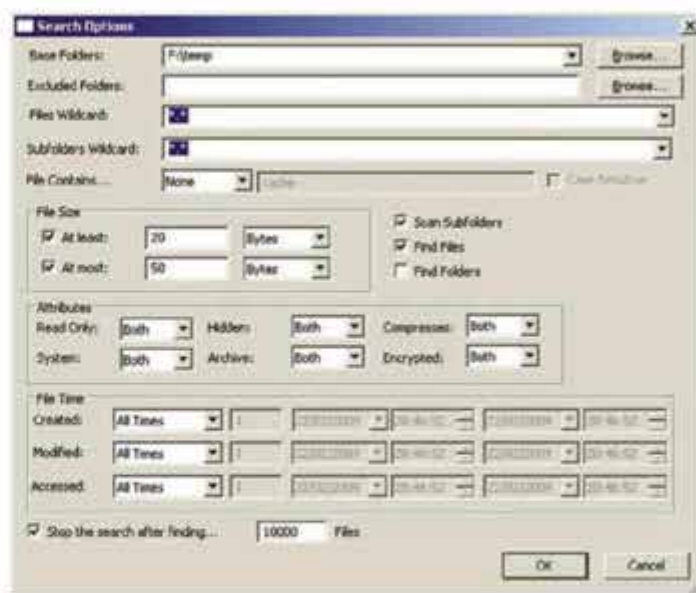
▲ DupeGuru may not be officially supported for Windows, but it's still one of the best duplicate file tools

never avoid them entirely. To deal with the eventual build-up, you'll need to employ more specialised tools to help you out. Luckily, there's no shortage of them in the wild, and you can download and run various solutions that will take care of the work for you.

It goes without saying, however, that these programs are used at your own risk. Any tool that can delete data from your PC, either at your command or automatically, and make changes to your file system always represents a potential problem. The wrong files could be removed, thus rendering programs unusable, so pay close attention to the program and its results in order to make sure damage is limited. It's rare, of course, and you can usually use these tools with little concern, but it's wise to be cautious all the same.

We'll begin with an app that a lot of people will already know about, and that's Ccleaner (www.piriform.com). This is well established as a PC cleaning tool, able to remove programs, junk and cache from PCs, and it also has a registry cleaner. Alongside these well-known features, though, resides a duplicate file tool.

This is found under the Tools section of the program, and once you open it, you can choose from various matching options, such as file size, name, modify date and content. You



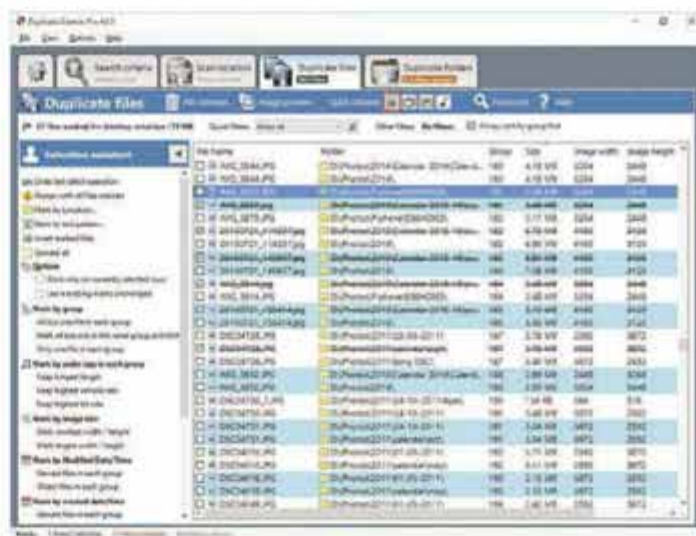
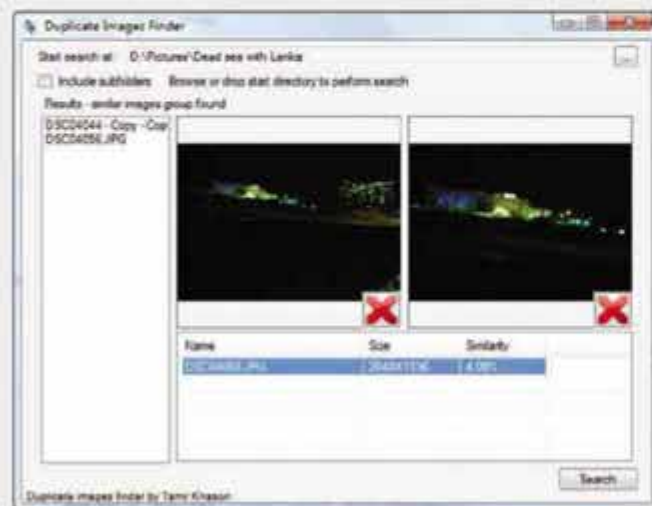
▲ SearchMyFiles is a file searching tool primarily, but it has a duplicate file function built in

Spot The Difference

Some of the tools we've covered have options to scan for image files, but you can also get applications that focus on just this task, which could be very useful for users who have a mass of images they need to trim down.

A tool like Duplicate Images Finder (duplifier.codeplex.com) is perfect for this, as it uses a special algorithm to analyse images, comparing them for similarities. It'll then let you know which files it considers to be the same or close enough.

This type of scan is very difficult to get just right, because image files are very complex, but the results generated by the program are nonetheless impressive, dishing out many images that bear a lot of similarities. This can help you gather together photos taken at the same time and in the same place, for example, so you can trim down the unwanted snaps and keep the best. The program is also free, and it's very useful for photography buffs who routinely take large numbers of photos and need to keep their disk usage down.

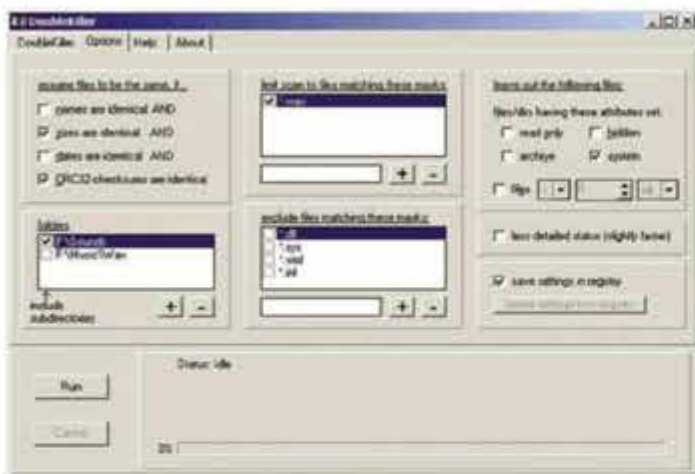


▲ DigitalVolcano's Duplicate Cleaner has a welcoming interface and some powerful file searching tools

can specify elements to ignore and can set the areas of your system you want to search. The program can then use your criteria to locate and eliminate any duplicates. It's very useful, but there are more powerful options around.

One of the best dedicated duplicate file tools we've seen has to be DupeGuru (www.hardcoded.net/dupeguru). This free tool excels at its job, which is to find and remove your duplicate files. It does this without overcomplicating things, and it's actually easier to use than Ccleaner's option. Here you simply point the program at a folder and ask it to scan. That's all you need to do. Once it's scanned the folder, the results are shown to you in a simple colour-coded format that indicates the original file and the various duplicates.

With this list, you can then opt to show only the duplicates, and you can sort the files by file size and view the match percentage, which gives you an indication of how similar each file actually is. This helps you decide if a file is a duplicate that's not needed or a file that's actually used by something else and should be kept.



▲ DoubleKiller is flexible and has some especially useful searching options

Some of the most common problems with duplicates come from collections of music and images. It's easy to download copies of these, and your hard drive can be quickly cluttered with clones. DupeGuru can take care of these, of course, but it also has specialised versions of the app that are designed for just these purposes. Both the DupeGuru Picture and Music Editions have tools that are designed to deal with these very different media file types. The picture version, for example, is able to actually analyse an image for content and is able to spot duplicates with different names or even dimensions. You can compare files manually too via the handy preview. The music edition of the tool is able to analyse format-specific data like meta tags, duration, bitrate and more to spot those niggling duplicates.

“ Any tool that can delete data from your PC, either at your command or automatically, represents a potential problem ”

This makes DupeGuru a good, all-round tool that can handle small to large duplication elimination jobs, and its ease of use makes it all the more recommended. Sadly, there is a caveat to this recommendation: DupeGuru no longer supports Windows and can only be downloaded from the official site for Linux and Mac OS X. However, you can still find Windows copies (no longer supported officially, of course) on many download sites.

Search My files (www.nirsoft.net) is another option, and this specialises in file searches and filtering options to help determine which files are duplicates. As to be expected, you can narrow searches by using file names, sizes, dates and extensions. The difference here is a bigger focus on power and manual input, since it's actually designed as a replacement for Windows' own file search function. Because of this, it's more complex than other programs, so isn't quite as easy to use or find duplicates, since it needs more information from the user, but it's certainly powerful. It can also be run directly from a USB drive and is fully portable.

As good as DupeGuru is, its availability problems may make it less appealing to some. If this is the case, we'd definitely point you towards DigitalVolcano's Duplicate Cleaner. This offers both paid and free versions, with the free one being feature limited, but still doing a good job for daily duplicate removal.

Its searches will reveal duplicate files and list them for easy marking for deletion. Filters allow you to sort results, and the interface is much more attractive than other apps, making it more appealing. The limited free version does omit two very useful features: the image and audio file tools. These are present in the paid version and function in a similar way to DupeGuru's specialised editions. If you need this functionality, it may be worth shelling out for the full version.

Finally, we have DoubleKiller (www.bigbangenterprises.de/en/doublekiller), the name of which says it all really. It's a powerful duplicate file finder and remover, and it has a very effective comparison system that uses hash comparison techniques and filters. You can use the program to compare fresh files against a list of known files. Files can be excluded from searches, and results can be exported to a text file to make things easier to keep track of if you have large searches.

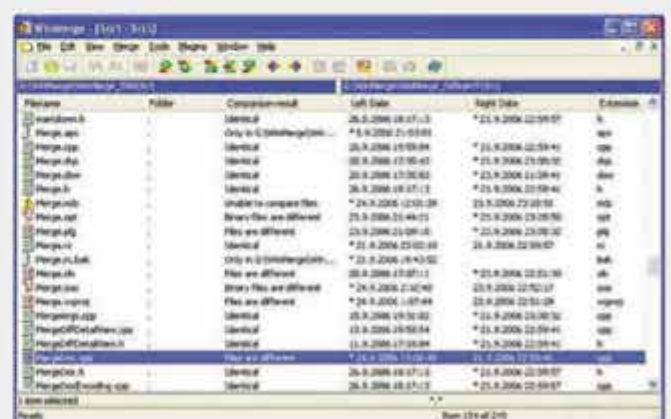
There are two versions of the program, a free edition and a paid one. The free edition is much more limited than the paid-for copy, but even in a limited form, it's still powerful enough for most home users.

There are even more file comparison tools out there, but we feel the programs we've highlighted here are some of the best, and if you struggle with any duplicate files, these will have you covered. Give them a go and free up your disk space. [mm](#)

Open Source Comparison

If you're a little more techy and you like your apps a little more sparse, but powerful, you may want to check out WinMerge (winmerge.org).

This isn't an attractive tool, but it's a very functional one. It's used to compare files, obviously, but can also perform text file merges and comparisons. It's small enough to run from a USB drive, and it also features a lot of advanced folder tools. Some would say it's an app aimed more at system admins, and the lack of a more welcoming GUI will surely put some off. Performance-wise, however, we found this to be a very worthy app and one that'll do just the job for users who don't mind putting in a little more hands-on effort.



Python >>> Generators

Mark Summerfield rolls up his sleeves and gets coding

In this article we'll see what generators are, why Python 3 favours them and how to create our own.

<Incidentally, Python 2 methods that returned sequences (e.g. `dict.keys()`), generally returned lists, while in Python 3 they return generators.>

Let's start with a couple of Python 3 examples:

```
N = 1000000 # 1_000_000
allowed in Py 3.6
lst = list(range(N))
gen = range(N)
print(sys.getsizeof(lst)) # 9000112
print(sys.getsizeof(gen)) # 48
```

So the list occupies almost 9MB, while the generator consumes a mere 48 bytes! Clearly generators can save a lot of memory. And it gets better.

If we change N to, say, 20 million, the list will occupy 180MB, while the generator still consumes just 48 bytes.

A list stores object references, so if we want to store a million numbers, the list will contain a million objects. But a generator stores a tiny bit of code – the code needed to generate each item on demand.

When I timed the code with 20 million numbers, it took 0.36 seconds to create the list and 1.1 seconds to iterate over it using a for loop, for a total of 1.4 seconds. For the generator, it took no time to create (well, less than 0.000004 seconds) and 1.3 seconds to iterate.

For lists, we pay an up-front cost in processing and memory to create the list and get fast iteration. For generators, there's effectively no setup cost and no memory overhead, but there is a tiny processing cost per item we iterate over. In practice, we normally do some per-item processing, which is usually so much more expensive than the tiny cost of generating each item, that generators are just as fast in practical use as lists. For these reasons, Python 3 always provides generators rather than lists when sequences of items are required. And, of course, we can always get a list (or tuple) simply by wrapping the generator in `list()` or `tuple()` – as shown in the example.

Like lists, generators have a literal syntax, for example:

```
odd_lst = [x for x in range(1000) if
x % 2]
odd_gen = (x for x in range(1000)
if x % 2)
```

The `odd_lst` list's size varies proportionally (e.g. 528 bytes for odd numbers less than 100, 4272 bytes for less than 1000 and so on), while the generator is a fixed size of 72 bytes. This generator is slightly bigger than the previous one, because the generating code is a bit more complex.

Using the built-in `range()` function or the literal syntax with parentheses is straightforward and useful.

Furthermore, many of Python's built-in types return a generator rather than a list – for example, `dict.keys()`, `dict.values()` and `dict.items()`. One other distinction between lists and generators is worth pointing out: lists are always either empty or of finite length, but a generator may be of any length – even infinite. Naturally, we would like to be able to make our own generators when appropriate. Let's start with a simple generator function that returns odd numbers:

```
def odds():
    start = 1
    while True:
        yield start
        start += 2
```

Although tiny, this function is quite sophisticated. When it's called, it creates a local variable called `start` with value 1. It then immediately begins an infinite loop whose first statement is `yield start`. When a `yield` statement is reached, the function returns the value of the `yield` statement (or `None` if there isn't a value given) and then suspends execution of the function. This means that all the function's state (in this case the value of `start`), is stored. The second time the function is called, it resumes from the statement following the `yield`, so in this case `start` is incremented to value 3, then the loop continues and again the `yield` is reached, so this time 3 is

```
Python 3.4.3 Shell
File Edit Shell Debug Options Window Help
>>> for pair in zip(range(13), range(0, -13, -1)):
    print(pair, end=" ")
(0, 0) (1, -1) (2, -2) (3, -3) (4, -4) (5, -5) (6, -6)
(7, -7) (8, -8) (9, -9) (10, -10) (11, -11) (12, -12)
>>>
```

```
Python 3.4.3 Shell
File Edit Shell Debug Options Window Help
>>> numbers = list(range(20))
>>> for even, odd in zip(numbers[::2], numbers[1::2]):
    print("{}#{}".format(even, odd), end=" ")
0#1 2#3 4#5 6#7 8#9 10#11 12#13 14#15 16#17 18#19
>>>
```



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The Bluetooth Headset Guide

What should you looking for if you're hoping to cut the cord?



Not that long ago, if you wanted wireless headphones, then they'd rely on either infra-red or RF technology. Those still exist, but ever since Bluetooth came along, wireless headphones have become far more prevalent, and prices have fallen too. In fact, we've got to the point where you can now find stereo Bluetooth earphones for less than a fiver if you look around.

We're not saying these are going to be great quality or that you should buy them, though, because such cheap headphones are likely to be badly made. Indeed, the quality of Bluetooth audio devices differs hugely depending on their price and what their intended purpose is. For example, if you buy a simple mono earpiece for taking calls from your mobile phone, it's not going to offer the kind of audio fidelity you'd get from a set of high-end Bluetooth stereo headphones. It's also worth bearing in mind that Bluetooth audio has improved a lot in recent years, so if you buy something older, there's a chance it won't meet your expectations.

“ Don't expect the cheapest headphones to match up to those that pack in all the latest features ”

You also have to remember that for audio to be transmitted over Bluetooth, it has to be compressed. The A2DP profile determines how multimedia is streamed, which includes support for the mandatory codec SBC (Low Complexity Subband Coding). This has several levels, and between your headphones and your sound source, you'll only get to the hear the lowest level. For instance, if your phone supports a lower level of SBC than your headphones, then it's the lower level that you'll hear.

Now consider that what you're listening to is already likely to be compressed, if it's an MP3 or similar, and you can see there's plenty of potential for information to be lost and for the sound quality to drop. That's not great if you're hoping to listen to the Bee Gees back catalogue in all its original high-fidelity glory.

What's the solution? Well, if you believe what technology companies are telling us, it's AptX, which is another type of compression, but one that works in a different way to things like MP3, using shorter samples to deliver better quality sound and lower latency. However, both the sound source and the headphone need to support AptX for it to work. You'll find that iOS devices, for example, don't support it, so you won't

be able to get the full benefit of AptX headphones with Apple's mobile devices.

Oddly, though, Bluetooth headphone can optionally include support for MP3, AAC and others, which would mean no re-encoding (to either SBC or AptX), yet headphone manufacturers don't seem to be taking advantage of this right now.

It's also worth taking into account the other audio-related Bluetooth profiles that headsets and headphones might offer. The Headset Profile (HSP), for instance, enables you to use a headset with a mobile phone. Plus there's the Hands-free Profile (HFP), which is similar but which adds some extra features like voice dialling. If you're going to be using your headset to listen to music on a phone, then this will be a valuable addition, because you can seamlessly switch from your tunes to your phone call.

Finally, you also need to be aware of what Bluetooth version a headset uses. Currently, we're up to Bluetooth 4.2, with version 5 being announced in June. You don't need to have the latest version, but there are some benefits to improvements in power consumption, data rate, pairing reliability and so on in later incarnations of the technology.

Ultimately, you normally get what you pay for, so don't expect the cheapest headphones to match up to those that pack in all the latest features. Also, it's arguable whether AptX can really offer CD-quality sound like it claims to.

Nevertheless, you should be able to find something to your liking, unless you're a true audiophile, because for all the criticism that can be aimed at Bluetooth audio, there's no denying it's a convenient way to listen to music wirelessly and from a range of different sources.

Now, bearing these things in mind (although admittedly there's a lot more to Bluetooth than this – see www.bluetooth.com), what should be looking for if you're after a decent stereo headset? We've been looking at what's on the market at the moment and found a selection of headphones to suit a range of budgets.

Ultra Cheap - £0 to £10

Sunvito 4 in 1 Foldable Bluetooth 3.0 Headphones (Amazon - goo.gl/cnrrRA), £9.99

Available in a range of colours (black, blue, red, and er... gold), these are unlikely to be high quality, and user reviews on the Amazon site suggest they're plasticky and liable to break easily. Also, the sound quality isn't said to be great either, but that's probably to be expected at this sort of price. What we didn't expect, though, was to find they have a built-in FM radio and a micro-SD slot. They're based on Bluetooth V3.0+EDR, so they're not the latest tech, but they support HSP and HFP, so you can make phone calls while wearing them. The fact they also use a



▲ Sunvito 4 in 1 Foldable Bluetooth 3.0 headphones



▲ Five U9 In-ear headphones



▲ Sond Audio Bluetooth On Ear Foldable NFC headphones



▲ Arctic P604



▲ *Creative Sound Blaster Jam*



▲ *Logitech H800*



▲ *Sony MDR-XB650BT*

standard micro-USB charging port is encouraging too, but in all honesty we wouldn't recommend them unless you're looking for something to last you the length of a plane trip or something similar. They're certainly not a long-term purchase.

Sive U9 In-ear Headphones (Amazon – goo.gl/ul9HX4), £7.99

Offering Bluetooth V4.0, these in-ear headphones claim to be 'sweat proof', which is possible an asset, because they're designed for sport and running. We can't say we've ever had a pair of headphones stop working on us because we've been sweating too much, but the only time you'll find the Micro Mart team running anywhere, it's when the chip shop's about to close and we need to get our supper. We'll take Sive's word for it, then.

“ For all the criticism aimed at Bluetooth audio, there's no denying it's convenient ”

What we know for sure is that they have a built-in microphone, so you can use them for hands-free calls, and the battery has an 80mAh capacity. Apparently, this will give you five hours' of use, but as with most battery quotes, we'd take that with a pinch of salt.

If you're strapped for cash or you need a cheap gift for someone you're not that keen on, then these will do the job nicely.

Cheap – £11 to £30

Sond Audio Bluetooth On Ear Foldable NFC Headphones (Ebuyer – goo.gl/Eu4TXr), £19.98

At this kind of price, you're still not going to get top-notch audio or the highest level of build quality, but you do get some useful features you wouldn't find more cheaply. For a start, these headphones are foldable and lightweight, so they're perfect for travelling. That said, they're made largely from

plastic, so our advice would be to pack them carefully, because if you just shove them in a bag, they might not last long.

In terms of the specification, they run on Bluetooth 4.0 and are said to have a ten-hour battery life. However, what's really useful is the NFC pairing ability. If your phone supports this, it means you can pair it with these headphones with a simple tap.

Mid Range – £31 to £50

Arctic P604 (Lambdatek – goo.gl/hTuJra), £40.24

Now we're on to something that looks like a proper headset. This Bluetooth 4.0 headset, which charges via micro-USB, comes with an 850mAh battery, which it's claimed gives it 30 hours of play time. Of course, such figures tend to be based on 'ideal conditions', but to honest, even if these headphones managed half of that, we'd be impressed.

You also get NFC pairing, so you can get up and running as quickly as possible, instead of having to fiddle around with Bluetooth settings when you should be listening to the dulcet tones of Kenny Rogers.

And you won't miss any calls either, because the P604 also offers a built-in microphone. Also, coming from a reliable manufacturer like Arctic, you can be sure you're getting something built to a decent standard.

Creative Sound Blaster Jam (Ballicom – goo.gl/6VxQXb), £34.67

We're assuming the name of this product has something to do with musicians 'jamming', rather than fruit-based preserves. Either way, it's a capable headset, which includes NFC pairing, Bluetooth V4.1, one-tap bass enhancement and a built-in mic.

Unfortunately, there's no support for AptX, so you won't be able to take advantage of that particular technology, but the Sound Blaster Jam does grant you excellent comfort and audio quality.

And, of course, you get the benefit of Creative's extensive experience, so you know you'll be getting something that won't fall apart in a week.

High End – £51 to £100

Logitech H800 (Stuff.uk.net – goo.gl/WBhv4c), £71.93

Logitech is, of course, a well-known brand, which produces a wide range of high-quality but reasonably priced computer

peripherals and accessories. It's no surprise, then, that it makes some decent Bluetooth headphones, including the H800 set.

Of course, £71 isn't a small amount of money, so what do you get here that you wouldn't with something cheaper? First, you'd expect higher build quality and better audio fidelity, which you do get, but there's more to this headset than that.

For a start, the headset folds up for storage, and it has a retractable boom mic with noise cancelling, and a built-in equaliser that optimises sound for chatting or for music.

But the thing we like the most is that as well as connecting to devices via Bluetooth (only version 2.1, oddly), it also comes with a 2.4GHz USB nano receiver so you can connect to a PC that way instead for higher-quality audio.

Sony MDR-XB650BT (Currys – goo.gl/kTbg8a), £79.99

Now, here's something you can actually find on the high street, should you feel like making an impulse purchase. And if you do, then you should be happy with what you get here.

Available in a selection of colours (red, blue and black), these Bluetooth V4.0 headphones offer one-touch pairing via NFC. Plus, they're part of Sony's Extra Bass range (or EXTRA BASS if you accept Sony's shouty all-caps spelling). In the company's own words, "This provides an acoustically tight seal for superior sound isolation and tight bass response." We'll take that to mean they sound like they cost 80 quid.

On top of that, the battery life is supposed to be up to 30 hours, you get a built-in mic for calls (with HSP, HFP and so on), and the earpieces swivel for flat packing.

Just Won The Lottery – £101 And Beyond

Bang & Olufsen BeoPlay H7 (John Lewis – goo.gl/NxTZft), £329

Let's get straight in here with something that will make your wallet shrink with shame. Bang & Olufsen is, of course, renowned for making high-priced, high-quality audio equipment, and this headset is no exception. Whether it's worth this amount of money is debatable, but if you can afford it, then you probably don't care that much.

This is the first headset we've included here that offers compatibility with the AptX codec (via Bluetooth V4.2). Like we said at the beginning of this article, you'll need an audio source

that also supports this codec, but assuming you do, then you should be in for a treat.

Charging over micro-USB, they offer something in the region of 20 hours of play, and the soft, genuine leather on the earpads provides both comfort and longevity. Plus, you can also use the H7 as a regular wired headset using the removable 3.5mm cable.

“ For audio to be transmitted over Bluetooth, it has to be compressed ”

You also get a built-in mic, a touch- rather than button-based control interface on one of the earpieces, and a choice of three colours: black, 'cenere grey' and 'natural' (which looks suspiciously like beige).

Perhaps surprising at the kind of price, there's no NFC, but that's a minor quibble.

Plantronics Backbeat Pro (LiGo – goo.gl/KtFQtJ), £109

Taking things back to a more sensible level, we have this attractive set of headphones from Plantronics. Having garnered rave review after rave review, it's clear this headset offers something special.

Not are they gorgeous looking and comfortable, but they offer NFC pairing and high-end audio via either Bluetooth with AptX or a removable 3.5mm cable. That means you'll never have to stop listening to your music to charge them up.

You also get a microphone for your calls, but it also offers a feature called OpenMic. This lets you hear what's going on around you, quickly and easily. That's important, because the Backbeat Pro also includes active noise cancelling technology (ANC), which can be turned on and off by flicking a switch on one of the earpieces.

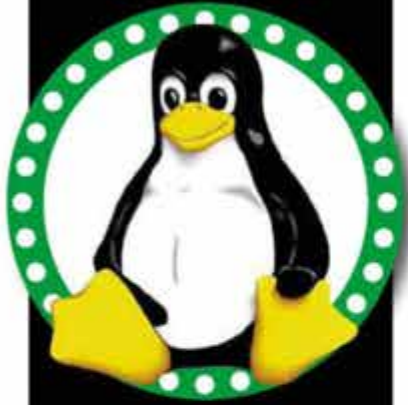
In terms of battery life, Plantronics suggests it's somewhere in the region of 24 hours, which isn't bad at all. [mm](#)



▲ Bang & Olufsen BeoPlay H7



▲ Plantronics Backbeat Pro



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

Windows And Linux

From an announcement to hatred

It's amusing to think that last week's Linux News had me looking out for a Linux alternative for Skype while this week will see me looking at the announcement from Microsoft on the Skype community forums that "exciting news for Linux users" is on its way.

However, that news will have to wait until a couple of weeks' time since the firm isn't quite ready to reveal the details just yet – although it was announced on the Skype boards, so we can pretty much assume that it has something to do with a proper Skype client, that's fully up to date, and works as well as the Windows version.

Microsoft has been quite a surprising voice in the Linux community as a whole over the last few months. First came the announcement of a partnership with Canonical and Ubuntu, then the Bash for Windows 10 feature add-in, the SQL improvements with Linux and other server related cross-platform instances, and rumours of an Office version specifically designed for Linux users.

It's hardly surprising that the company has a relatively new-found love for Linux, the open source world has grown significantly in the last couple of years, and Microsoft could be seen as foolish for not finally trying to cash in on what's available – especially since the company missed the boat in terms of the mobile marketplace.

Could we see a potential Win-Lin in the coming years? An operating system where Windows and Linux are one, and programs for both platforms can be easily installed without the need for any kind of emulation or slimmed down APIs? Doubtful – but, in an infinite universe, anything is possible.

Microsoft Hate

Naturally, with every release that Microsoft make for Linux and every step it takes towards bringing Linux into its operating system and programs, there's going to be some hateful comments bandied about. There are comments from forums detailing a conspiracy theory that Microsoft actually owns Canonical, and that it's manipulating the biggest Linux user base into eventually turning to Windows 10. Another has Microsoft

purposely infecting the Linux community with malware, and another dictating that it's trying to harvest data from the Linux community by introducing Linux products – therefore reaching into the lives of a user base that has so far managed to avoid its clutches.

Whether you believe in any of this is purely up to you, but as long as Microsoft exists there'll still be those who'll credit it with everything from being the second gunman on the grassy knoll to faking the moon landings. Either way, Microsoft is making some significant moves into Linux territory. What all this will eventually come to is anyone's guess – including those with an over-active imagination – but any improvement between the two platforms must surely be a positive one.

▼ *Microsoft and Linux, hand in hand or something more sinister?*



Aural Treats

Sven Harvey samples the latest remixes of Amiga music

A spin-off of C64 Remix, **AmigaRemix.com** provides hundreds of free fan-made remixes of music featured in Amiga games and demos. June and July (thus far) has seen a good number of new uploads made available and these are the standouts!

daXX

After winning best Amiga remix of 2015, daXX continues with some great remixes. In fact, if the word daXX appears you pretty much are guaranteed and audio masterpiece. Two pieces of music from Anarchy's 3D Demo have been daXXed appropriately, along with D-Mob's Music Disk 3 (which includes some melodies that would have been in the top 40 at one point...)

However, it's the remix of the intro from *Lotus Turbo Challenge III* that grabbed my attention in the June uploads. While remaining fairly true to the original instrumentation the rearrangement does the track a lot of good, while most definitely allowing you to reminisce back to the release of the game in 1992.

In July however daXX's remix from *Pinball Dreams*, of a track seldom attempted has made its way onto my playlist. The Beatbox table in *Pinball Dreams* is perhaps not many people's favourite to play, and Nightmare usually takes the best music prize... but Beatbox's quirky theme tune was, and is, great. This daXX remix, as usual for the remixer, most

definitely echoes the original through time (*Pinball Dreams* was released in 1992 by DICE) and yet still brings the audio quality right up to date. A real blast from the past, partially because so few remixes have been done.

Super Stardust

After *Stardust* first hit the ST and waaay before *SuperStardust HD*, *Super Stardust* was released on the AGA Amiga's (including the CD32) in 1994/5 and had a special mission, which included a music track which starts off at a significantly lower tempo than the main soundtrack to the game. As a result of that, it's not been attempted previously often, so Powertrace's remix is especially welcome. The thing is that it's a fantastic track and quite immersive, and the remix only makes it more so – synth piano and up.

Turrican

Okay, so the *Turrican* games have music from Chris Hulsbeck and have been remixed by almost everyone on the remixing scene – simply because they are so good, everyone wants to enhance their favourite parts. In the recent batches added to AmigaRemix there are two remixes from the game series.

The first is a trance remix of the theme from the original game (which was going in the synth trance direction anyway.) This is really just an enhanced version of the original, but thus must be worth checking out.

Meanwhile, LordPrenzer's interpretation of the Great Bath theme from *Turrican II* takes a different path by using harpsichord and piano samples as well as an echovoice-type instrument to produce a recognisable, but wonderfully different, take on a piece of music that many will be familiar with while giving it a slightly eerie feeling.

In the department of 'huh?' comes Guemill's interpretation of the first theme from level 5 of *Turrican II* which is really bass heavy and works in a very different way to all the other remixes of the tune I have heard thus far. I am sure it won't be to everyone's taste, but is well worth a download and listen!



Kickstarter Success

The Story Of The Commodore Amiga In Pixels Kickstarter campaign was successfully completed, hitting over the £55,000 mark to secure the audio CD of remixed David Whittaker tracks from Allister Brimble. The book and various extras will be hitting backers doorsteps in the new year... so expect a review then! Keep an eye on fusionretrobooks.com for general availability.



Sven Harvey has been our Amiga specialist for over 16 years, drawing on his 25 years retailing computer and video games and even longer writing about them

Amiga



Ian McGurran is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

How Do You Get Pikachu On a Bus?

With Pokémon Go, Ian McGurran can finally say he's going to the gym

Remember Pokémon? The staggeringly obvious/clever roleplaying game that took what might be a side-quest in a standard RPG and made an entire game, nay, an entire business out of it?

While Pokémon may have faded from the general public's consciousness a little in recent times, but on Nintendo platforms the franchise lives on very comfortably – with two new 'proper' games every 1-2 years, and a myriad of other stuff including a TV series, films, trading cards, toys, and so on. Put simply, alongside the ludicrous success of the Wii, it's Pokémon that's arguably kept majority owner Nintendo afloat.

Now the concept has left Nintendo hardware and made the leap to mobile, in the form of one of the most talked about video games in years – *Pokémon Go*. Like other Pokémon games, developers Game Freak haven't messed with the basics too much, sticking with the "gotta catch 'em all" concept that's always driven the games. The difference this time, however, is that these imaginary creatures no longer live in a virtual world, but in an augmented version of the real world. As such, *Pokémon Go* makes use of a mobile device's location features, placing the Pokémon around an area for you, the player, to catch with a Poké Ball.

There are the usual fights and gyms too, but it's the excitement of uncovering Pokémon around where you live or work that's uniquely compelling. Especially when you're not the only one doing it, so you and another

person could end up fighting over the same virtual monsters.

The game is actually based on a long-running mobile title called *Ingress*, from ex-Google staffers working under the name Niantic, with some going so far as to describe *Pokémon Go* as *Ingress* reskinned. *Ingress* is more sci-fi based, however, and doesn't quite have the same cache as the monster collecting behemoth from Japan, nor the huge user base.

The staggering explosion of interest in *Pokémon Go* in the US and Australia/NZ (the only places it had been released, at time of writing) has led to server overloads and high demands. It's also led to a jump in Nintendo's share price of 25%, so good news for some, bad for others.

Alongside stories of happy Nintendo shareholders, there have also been some frankly bizarre ones – including many detailing injuries suffered by those too busy looking at their phones than say, the road they are wandering into. There's also stories of armed robbers gathering where Pokémon are situated in order to ambush

any players, inappropriate hunting of Pokémon and Pokéstops (a kind of ball/egg refuelling stop) in locations such as Australian police stations and even holocaust memorial sites. However, the downright strangest story has to be the player in Wyoming who, instead of finding a Pokéstop, found a dead boy in the water. Nice.

It should be noted that at no point should you be required to enter a building or go to any particularly dangerous or secluded places. The crowdsourced data from *Ingress* is supposed to help with that, and all searching should be in safe, open places.

Mobile and home gaming have co-existed for a while now but mobile has often been seen as a 'little brother', and many gamers haven't found a mobile game to rival the classics of the genre. *Pokémon Go* has its roots in traditional gaming, but a USP that home consoles can't possibly compete with – and, despite it not being a perfect game, it might well be mobile gaming's first killer app.

So how do you get Pikachu on a bus? Well....you poke 'im on....



The Man Who Stares at Notes

Remote working and viewing is more possible than ever, but it could be better as, Andrew Unsworth points out

One of the best things about the internet is the way it's transformed the way we communicate with each other. VoIP and elaborate messaging services allow people to communicate with each other quickly, effectively and cheaply. Many of us use Facebook, WhatsApp, Skype and so on to keep in touch with friends organise trips and events, and so on, and remote meeting and conference services such as Cisco's WebEx have been a real boon to business. However, I'm also certain that many businesses aren't getting the best out of their audio-visual communication services and equipment. In my experience, this is more of a cultural issue than a technological one.

The majority of phones and tablets on sale have forward and rear facing cameras, and many laptops have webcams, so audio-visual communication should be a doddle. However, I've been in many remote meetings where there has been an option to view a video feed of each delegate but no-one has taken advantage of it.

This shouldn't be an issue, as the virtual meeting should just be a glorified phone call between colleagues, except that an important part of communication in meetings is non-verbal. Facial expressions, a person's general demeanour and even the ability to lip-read what they're saying – which is important when the audio quality isn't so good – are all lost when a meeting is audio-only. Is this person sincere? Is everyone paying attention?

Has anyone nodded their head in approval at what I've just said or has anyone shaken it in disapproval? All these questions and more go unanswered when you're in an audio-only meeting.

If delegates used the cameras on their devices we wouldn't have this problem. Maybe it's time to politely suggest it to our colleagues, and overcome any objections they have by explaining the positive outcome of using video to communicate.

Beaming From 'Ere To 'Ere

Remote working can be problematic, too. What if you need to work from home, but want to be part of a team, join in with banter or simply keep an eye on the office? One company hoping to provide a solution is Rabbit Products (www.rabbitproducts.co.uk), which produces the Beam 'mobile telepresence' robots.

These robots consist of a moving base and a long stem that's topped off with a video screen and a camera. The screen is ostensibly for showing

the face of the remote person, while the camera allows the remote worker to survey their remote territory.

There are two robots, the Beam+, which has a 10.1" screen and 2hrs of battery life, and the Beampro, which has a 17" screen and 8hr battery life. The use of either robot requires the downloading of an app, which is then used to allow control of the device.

The Beam robots look good but, for me, they raise some questions. They seem okay for those with flat, open-plan offices, but how effective would they be in offices with the odd step between areas? Can you turn on the machine remotely? Can I mod the Beam robot to look like the baddie cyborg in *Robocop 2*?

I think it'd be neat to get one of these robots in for review, and I can imagine a few of my MM colleagues using these devices to sneak up on their kids to remind them they're supposed to be doing homework, not watching cat videos on Facebook.



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner and his handshaking skills are second to none

Hardware



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Gaming

To Be This Good Takes Ages

Sega has acquired Endless Space developer Amplitude. It's all part of the publisher's new focus on PC strategy games such as the Total War series

This week, Ryan looks at Sega's acquisition of Endless Space developer Amplitude, and checks out *Evolve*'s move to a free-to-play model...

Plug & Play

Amid news of falling profits, Sega announced a number of changes to its core business in January 2015, ranging from staff cuts to a new focus on mobile and PC gaming. It marked a further step away from the console business it once dominated at the peak of its powers in the early 1990s, and a greater focus on the stuff it's released as a publisher in the 21st century, such as Creative Assembly's range of superb strategy games.

That PC-based, strategy focus is set to continue with Sega's acquisition of Amplitude, the Paris-based studio that, within just five years of its founding, has made a name for itself thanks to the popular tactics game *Endless Space* and its sequels *Dungeon Of The Endless* and *Endless Legend*.

The Amplitude deal will see Sega publish the studio's sequel to *Endless Space*, which is set to enter Steam Early Access later this year. First announced in July 2015, *Endless Space 2* will, like its predecessor, be a 4X (expand, explore, exploit, exterminate) strategy game where you build a spaceship and blast off on a bout of

galactic domination. Thus far, Amplitude has announced two rival factions for the game, the Sophons and the Crave, which vary wildly in culture and temperament. The Sophons are scientific and highly organised, while the Crave are more violent and locust-like in their desire to overwhelm other planets. There will be other minor factions to choose from, too, which Amplitude will gradually reveal via *Endless Space 2*'s nicely designed Wiki.

The acclaim which greeted *Endless Space* means that its sequel is something well worth looking forward to, and Sega's marketing clout should mean it finds the audience it deserves. Our only disappointment? Sega's greater focus on the strategy market, and the tepid sales of Creative Assembly's brilliant, incredibly unnerving *Alien: Isolation*, mean that we almost certainly won't be seeing a sequel to that game anytime soon.

"*Alien: Isolation 2* is not out of the question," Creative Assembly's studio director Tim Heaton said last year. "But do we really want to be spending very significant amounts of money, and getting close to break-even or just about in the

black? That's not where Sega wants to be, when we have a brilliant portfolio of other games that do great business."

It's an unfortunate state of affairs, to be sure. But on the plus side, having Amplitude and Creative Assembly under Sega's wing means we should be seeing plenty more PC-exclusive games coming our way soon.

Online

When *Evolve* was announced a few years ago, it looked and sounded like a natural successor to the multiplayer hit, *Left 4 Dead*; a new twist on the kind of asymmetrical action Turtle Rock Studios had helped define in that earlier zombie shooter, it saw four players team up to bring down a single player-controlled monster, which made up for its lack of agility with its sheer strength.

The air of positivity surrounding *Evolve* continued from its pre-release era, where it won all kinds of 'best in show' awards at gaming expos, to its launch in February 2015 where it rapidly shot to the number one spot in the charts. It's fair to say, however, that *Evolve* hasn't enjoyed the same player loyalty as *Left 4 Dead*; this may have



▲ Turtle Rock's four-on-one shooter *Evolve* has struggled after a muddled launch, but its move to free-to-play means that, right now, it's seeing a boost in player interest

been due in no small part to the way Turtle Rock marketed the game in different tiers. With three different editions for players to choose from and also a season pass, the way *Evolve* was sold sparked no small amount of confusion and disgruntlement online.

For much of the past year, *Evolve* has struggled to get its player count into the thousands; in early July, the number of players logged into *Evolve* was reportedly as low as 157. When you consider that *Evolve* is the kind of online game that lives or dies by the

number of people engaging with it, that's pretty bad news for Turtle Rock. The studio has clearly understood this because, on the 7th July, it relaunched the shooter as *Evolve Stage 2*, a free-to-play iteration of the game that also makes a number of changes to its balance and mechanics.

While *Stage 2* is in its beta phase right now, the shift to free-to-play seems to have done the trick, at least for now; on the day of launch, its player count leapt from the low hundreds to a far healthier 25,167, shoving *Evolve* into

Steam's top 20 most-played games for the first time since its launch in 2015. As *Stage 2* went live, Turtle Rock took to the web to admit that *Evolve*'s initial release and reception hadn't got quite gone to plan.

"When *Evolve* launched, the reception wasn't what we expected," Turtle Rock wrote. "The DLC [controversy] hit full force and washed away people's enthusiasm, dragging us further and further from that first magical pick-up-and-play experience."

The relaunch has certainly seen a pick-up in interest, and those who bought the game in its original state will be given "founder" status, which will give them access to rewards later in the game's lifecycle. Even now, *Evolve* isn't troubling shooters like *Counter-Strike GO* (615,231) or even the ageing *Team Fortress 2* (73,553), but compared to where the game was just a few weeks ago, *Stage 2* seems to have given Turtle Rock's shooter the fresh burst of energy it needed.

Incoming

On July 7th, the staff of British indie developer Hello Games cracked open a few bottles of fizzy wine and took a picture of themselves smiling and cheering into the camera. It's been a long haul for the team's space sim, *No Man's Sky*, but that picture, shared on Twitter, announced that its ambitious game was finished.

You might remember that *No Man's Sky*'s original release date was set for June this year, and that when this was pushed back to August, Hello Games reportedly received death threats. Well, for anyone else fearing that the studio might push the release back again as it approached, rest easy: *No Man's Sky* has gone gold, which means that its previously published date of the 10th August will definitely be met.

Described as a game of exploration and survival, *No Man's Sky* could be one of the best science fiction titles we'll see all year. Let's hope it lives up to the huge expectations that have gradually built up around it. [mm](#)



▲ Space sim *No Man's Sky* has officially gone gold, which means that its 10th August UK release is a lock. Exciting times

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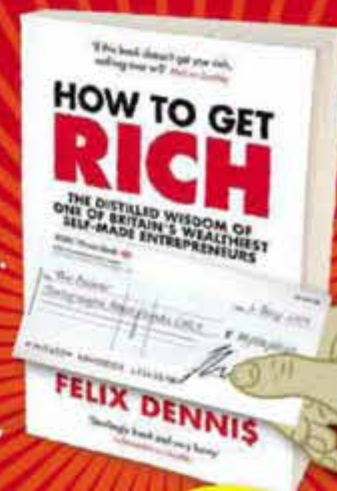
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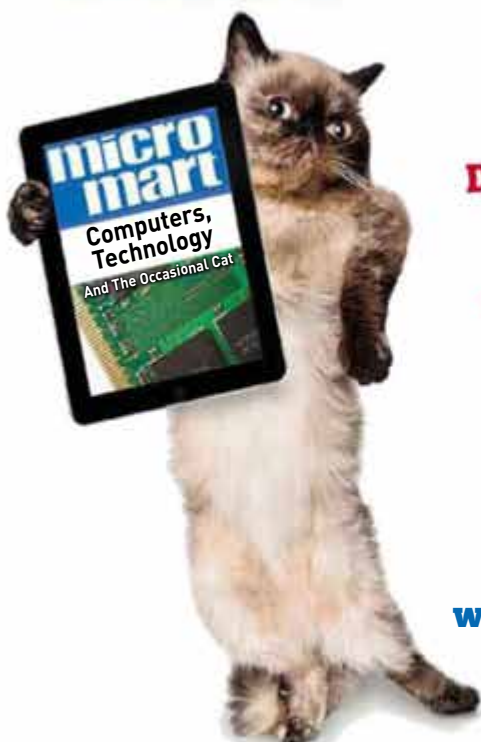
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Aaron

Black On Black

My PC has become totally unusable. Although I've not done anything to the system – I've not even installed any new software – but, for some reason, it's decided to stop functioning. I boot up the system as normal, but when I get to Windows all I get is a black screen, just black. I can see the mouse cursor, and it moves, but there's nothing else, and Windows never loads.

I have managed to get into safe mode once, I believe as an admin account, but other than that, I can't get the system to work, and Safe Mode isn't really useful for my normal tasks as I'm not using my account, so anything I do is pointless. My sister also managed to log on as a guest user, but this is very limited and has the same problem as Safe Mode.

I've never encountered this kind of problem before, and to be honest, I'm more than a little concerned as I have a lot of data on my system, and it's very important I get this back. My PC is an everyday tool for me, I'm pretty lost without it. I'm really hoping you can help with this, and I'd be grateful for any advice you have.

Kim

Getting any form of error message, especially during boot up, can be worrying. Boot up issues can be some of the trickiest to solve as you can't easily get into Windows to fix them. An error that doesn't even show, such as your black screen problem, can be even more of a problem, as you've got little to nothing to go on. In your situation, however, I feel as though the answer is pretty straightforward.

You mention that you can get into Safe Mode as an admin, and have managed to log on to a guest account. This leads me to suspect your problem is a corrupted user profile. This is quite common, as evidenced by another recent letter I had, and although it's easy enough to fix, it's also understandably worrying as your profile can hold a lot of data you certainly won't want to lose.

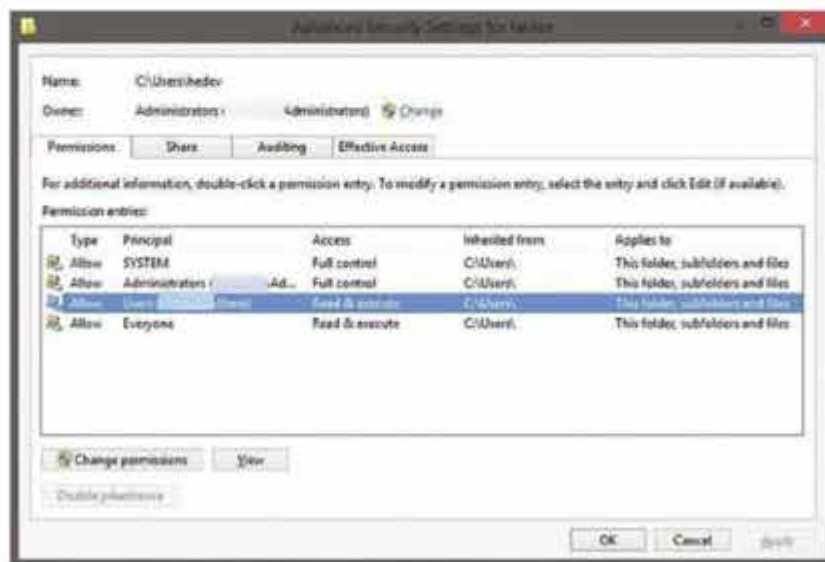
The simple solution here is the best, and that's to create a new profile and then migrate the data from the old, corrupt profile. As you can log on as an admin account in Safe Mode (and likely normally if you try this), it won't be a problem. By logging on as your admin user, you can easily create a new user account. Once you have this, using the admin account you can copy your old profile's folder to the new profile, overwriting the new folders with your old data. Then, still as the admin user, ensure the new profile takes ownership of the folders to make sure they're usable.

To do this, simply go to the Users folder on the OS drive (likely C:) and right-click the folder(s) in question. Select Properties and then click Security, followed by Advanced. Next to the Owner value, click Change and then enter the new profile name and click OK. Ensure the permissions are correct and then click Apply. The new user should now have ownership of the files.

Once you do this, log on as the newly-created profile, and check that everything is working as needed. When you're sure you have all the data and settings you need, you can then remove the old profile and delete the folder. Of course, don't do this until you're absolutely sure you've got all of your data and won't lose anything when you delete the old folders.

All of that said, if you'd prefer to spend more time fixing the actual issue, it's simply a matter of careful testing and using various tools to narrow down your issues. It could be wise to run a repair install of Windows, and to use Safe Mode to disable any startup applications and services. The latter of these will help you identify any potential issues with programs or services that could affect your system so you can disable them and fix your original profile.

I'd also recommend you think about running various security scanners, including malware checks, as it's not out of the realm of possibility for malware infections to cause this kind of issue.



◀ *If you create a new profile in order to get rid of a corrupted one, don't forget to sort out file permissions and ownership*

Sudden Stutters

My PC is a solid system designed for gaming, and although it's not too new (it's three years old), I've always kept it as up to date as I can, upgrading it when possible. At the moment, I have plenty of RAM and a decent CPU, all I've upgraded recently is the GPU for a more powerful model (a GTX 960).

I've become quite proficient in tuning my PC for gaming, and I can often reliably get good frame rates in even the most demanding games. After my last upgrade of the graphic card, though, I'm now experiencing a lot of lag and frame rate drops in some games, even ones that aren't very demanding. As I've added a more powerful GPU, this makes no sense to me, as I should, if anything, have much better frame rates. Care to comment on this and help me get my performance back?

Alan

It's a common misconception that upgrading to a more up to date and/or powerful piece of hardware will guarantee improved performance. In terms of graphics cards, it's expected that such an upgrade will always grant better frame rates. Sadly, this isn't always the case, though, and sometimes an upgrade can actually deliver inferior performance. Why is this?

The most common cause lies with driver conflicts or issues. Users can forget to remove old drivers, or, if they're upgrading to a similar GPU in the same series, old drivers may remain untouched, and the same one can be used for the new card. This is usually a mistake, and even when upgrading to a same-series card you really should remove old drivers prior to the upgrade and ensure the latest drivers are then installed.

Making sure Windows is up to date is also wise, as new drivers can sometimes lead it issues with older version of Windows, including current editions that lack the latest Windows updates. A good, clean system will also benefit you, so ensure you clear out all junk files and caches.

Standard housekeeping out of the way, there are also other concerns that aren't as easily solved. A likely cause for sluggish new hardware is a lack of power. It's easy to upgrade to a new,

more powerful piece of hardware without taking into account the limitations of your power supply unit. Beefier hardware will likely require more juice, and if your PSU can't supply this properly, your new card will struggle. This can lead to slow performance or even more severe issues, so always check that your system's PSU is able to supply the required power.

Another issue that also stems from the upgrade's more powerful nature is cooling. Hardware that's more powerful can use more power, and this will, in turn, generate more heat. A heat build up can lead to all sorts of problems, including a drop in performance. So, check the system has adequate cooling to cater for the new hardware, and that there's decent airflow throughout the case. If the new card is physically larger, it can interfere with this airflow.

“ Sometimes an upgrade can actually deliver inferior performance ”

Lastly, it's possible you may have some corrupt Windows files, as this has been known to cause this kind of performance problem. It's relatively simple for you to work out if this is the case using the built-in Windows file checker. To do this, firstly you have to open up an admin command prompt and type in 'sfc /scannow' (without the quote marks) then press Return. It's best to do this in Safe Mode for the best performance of the tool. With luck, the file checker, if it finds any problems, will fix the issue. Reboot, and give your system a run to see if the problem has been resolved.

▼ **Check Windows' files for any problems if your PC is running slow, and you may find the problem easily fixed**



```
Administrator: Command Prompt - sfc /scannow
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Windows\system32>sfc /scannow

Beginning system scan. This process will take some time.

Beginning verification phase of system scan.
Verification 16% complete._
```

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Jason

Still Got The Blues

In issue 1,417, Francis Kinsler was trying to upgrade his lad's old Socket AM2 system to Windows 10. 'But it keeps giving a BSOD on boot,' he wrote. 'I'm told everything used to work great, but all I'm getting since bringing it home with me is a TDR failure.' This was with Windows 8 Pro. His research led him to believe the problem was graphics-related. 'I'd try a different driver,' he concluded, 'if only I could get the PC to boot!'

I replied with this: 'TDR stands for "timeout, detection, and recovery". Yes, it's graphics-related – the driver is crashing and restarting.' I doubted it was a driver issue, however – Windows wasn't completing its launch, so only the generic VGA driver would have been in use. Instead, I pointed the finger at the graphics card itself, a 'silent' Radeon HD 6670. 'Perhaps it's been regularly overheating – a common scenario for fanless cards, especially if there's inadequate case cooling.' I suggested that a Radeon R7 250 or GeForce GT 740 would make a suitable replacement.

But maybe I was completely off-target...

I took your advice and bought a Radeon R7 250, and this did the trick. At first! I've managed to install Windows 8, 8.1, and now 10 – quite some progress from before – but when Windows 8.1 was in brief action, I got a Catalyst driver error. I ignored this, thinking I'd sort matters once Windows 10 was up and running. Big mistake! Now the old TDR error has returned.

All in all, it's looking as though it's been a software problem all along (I'm still glad I've upgraded the graphics card, though). The BSOD references the file 'atikmpag.sys', and online solutions suggest updating the BIOS or making a copy of this file and putting it in a different folder (I can't remember which). As

Windows won't even stay on for more than a few seconds, a BIOS update seems my only option (though some people have ended up with bricked hardware). Are we talking about the graphics card's BIOS or the motherboard's? Help!

Francis Kinsler, Gmail

Try running Windows in Safe Mode. The usual method to enter that is to mash the F8 key before the Windows splash screen appears, but that often doesn't work under Windows 10, particularly if the boot drive's an SSD or the motherboard's got a UEFI and not a BIOS (you're in the clear on both counts). If you find yourself struggling, try the other methods: goo.gl/ETeBv.

*Safe Mode will use Windows' own, generic graphics driver, not one from AMD. If that doesn't get you out of the woods, the problem isn't software. If you're home and dry, though, Francis, hop onto another PC and visit the Catalyst driver page: goo.gl/Xw2ywu. Download the latest suitable driver for the R7 250, drop it onto a USB stick, then go back to your lad's PC and install it. * Afterwards, reboot the PC, this time as normal, not in Safe Mode.*

Done and dusted, or done and still busted? My bet is that the PC will continue to fall over. I still reckon this is a hardware problem, you see. All the signs

point that way. We can rule out the graphics card, so I'll say what I always say: hard-to-isolate hardware problems almost always come down to the motherboard. A likely scenario here is a PCI Express graphics slot with worn or flaky contacts.

Another good bet is dodgy RAM. I believe 'atikmpag.sys' is a page file, and that will reserve a chunk of system RAM – probably always the same chunk. And if that chunk's faulty...

I urge you to visit www.memtest.org and download Memtest86+. Choose the file labelled 'Auto-installer for USB Key', which when run will put Memtest86+ onto a bootable USB stick (any size will do). Afterwards, boot up your lad's PC with it. If the PC stays up long enough, I think you'll see big red errors. If it bombs out before reaching that far, however, get online and track down a replacement Socket AM2 motherboard.

Note – I really wouldn't mess about with BIOS updates, especially not for the graphics card. I'd be staggered if that was a factor here.

** If you enter 'Safe Mode with Networking' rather than simply Safe Mode, you may – may – be able to use Wi-Fi, meaning you can do the whole job direct from your lad's PC.*

▼ Red is dead

MemTest86+ v6.10									
Pass 92%									
AMD R7 2713 MHz: 1 Test 57%									
L1 Cache: 64K 14468 MB/s: 1 Test 48 (Module 20, random pattern)									
L2 Cache: 1624K 15589 MB/s: 1 Testing: 132K - 960M 958M									
L3 Cache: None 1 Pattern: 3028b7dc-6									
Memory: 958M 2759 MB/s: 1									
Chipset: AMD R7 (ECC: Disabled)									
Settings: RAM: 452 MHz (DDR904) / CAS: 4-8-10 / DBR-1 (128 bits)									
WallTime	Cached	ReadMem	MemMap	Cache	ECC	Test	Pass	Errors	ECC Errs
0:24:10	958M	2768K	0020-Std	on	off	Std	1	3269	0
Test	Pass	Failing Address	Good	Bad	Err-Bits	Count	Chan		
0	1	0003207b4e4 - 000.6MB	3028b7dc	cf47b7dc	ffff0000	3261			
0	1	0003207b424 - 000.6MB	3028b7dc	cf47b7dc	ffff0000	3262			
0	1	0003207b364 - 000.6MB	3028b7dc	cf47b7dc	ffff0000	3263			
0	1	0003207b4a4 - 000.6MB	3028b7dc	cf47b7dc	ffff0000	3264			
0	1	0003207b5e4 - 000.6MB	3028b7dc	cf47b7dc	ffff0000	3265			
0	1	0003207b774 - 000.6MB	3028b7dc	cf47b7dc	ffff0000	3266			
0	1	0003207b7c4 - 000.6MB	3028b7dc	cf47b7dc	ffff0000	3267			
0	1	0003065f44 - 864.3MB	3028b7dc	cf47b7dc	ffff0000	3268			
0	1	0003065f84 - 864.3MB	3028b7dc	cf47b7dc	ffff0000	3269			
[ESC]Reboot [F1]Configuration [F2]Scroll Lock [CR]Scroll Unlock									

Plug And Pray

And on a similar theme...

I've upgraded my eight-year-old Dell Vostro 410 to Windows 10 Pro. All's well except for my 22" Philips monitor (plugged into a Radeon HD 5450). This is less than two years old, yet there are no drivers for Windows 10 or even Windows 8.x. Because of that, Windows detects it as a Generic Non-PnP Monitor. The available screen resolutions are consequently somewhat limited, and the picture's distorted. Any ideas? I don't want to have to buy another monitor.

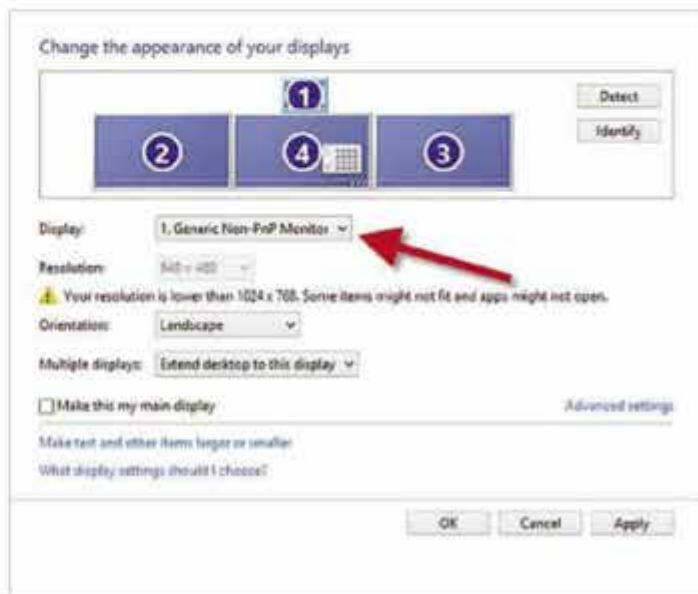
Jack, Virgin Media

This is nothing to do with the monitor. I'm sure of it. A monitor only really needs a driver if the user wants to calibrate the colours and use it in, say, Photoshop. For starters, then, Jack, switch the monitor off and unplug it from the Radeon. Wait a few seconds and plug it back in and switch it back on. This should cause Windows to redetect it, which may be the end of the story. I suppose there's a chance the cable – HDMI or DVI or whatever type it is – could be loose or faulty.

Almost certainly, however, you're in need of a graphics-card driver. I reckon the HD 5450 is using Windows' standard, fall-back driver, not a 'proper' one. By the time you read this, Windows Update may well have solved the problem for you, but if not, the newest compatible drivers from AMD are available at goo.gl/ZkLoYk (64-bit) and goo.gl/TjLALw (32-bit). My advice is to try

the older, non-beta driver first (official support for the HD 5450 ceased some while back), resorting to the newer, beta one only if you run into grief.

▼ **What does this mean, and what can you do?**



Card Game

I hear that Samsung has launched some new ultra-fast memory cards. Apparently these use the UFS standard, but it's not clear what devices they're compatible with. They look just like microSD cards. Can I use one in my Galaxy S7 Edge?

John, Gmail

UFS – Universal Flash Storage – is used in the latest smartphones for internal storage. It replaces the old eMMC standard and is basically just a damned sight faster. Both types of storage can be thought of as mini SSDs. Ratified earlier this year was UFS Card Extension, which puts UFS technology onto portable memory cards.

Sadly, John, such cards won't fit into microSD slots. UFS cards and microSD cards are certainly very similar in size, but the cutouts along the edges – which resemble a shark's fin, I always think – differ in location and shape. No doubt upcoming phones and other devices will soon support the new cards – especially as manufacturers are working on slots that'll accept both old and new – but at the moment they're a product no-one can use. Samsung is currently the

only manufacturer, and it's bizarre that it's not chosen to launch the cards in sync with a phone with the right slot.

All things must change. The SD standard has done us proud but it's really quite long in the tooth now. The plethora of speeds – Class 2, 4, 6, 10, UHS-I Class 1 and 3, UHS-II Class 1 and 3, and now V6, V10, V30, V60, and V90 – are almost impossible to understand

without the aid of a packet of Anadin and caffeine on an IV drip. Samsung's new UFS cards have transfer speeds of up to 530MB/s and IOPS scores of up to 40,000, leaps and bounds ahead of even the most expensive microSD cards. I love it.

▼ **The SD standard has had a good innings but now UFS is about to run it out**



Crowdfunding Corner

Mobile-focussed projects continue to have a strong presence on Kickstarter, and this week we're combining sound and vision for one audio project and one photography project...

ELWN Fit

Getting earbuds that fit perfectly is a tough task – after all, every ear is shaped differently. Usually, if you want decent-fitting earbuds that are also wireless you have to spend a lot of money. The ELWN Fit earbuds, however, come with a whopping 48 different accessories – allowing for 180 different potential fits, so the odds you'll be able to find exactly the fit you need are increased significantly.

In addition, the Bluetooth headphones also come with an 'infinity band' charger, though each earbud holds a three-hour charge, but when connected to the mini-USB Infinity Band (which hands around your neck) the charger can reclaim kinetic energy and use it to charge the headphones, extending the battery life by more than double under normal circumstances.

As befits the Kickstarter audience's seemingly limitless appetite for portable audio products, the cheapest Fit tiers have all been taken. You should, however, still be able to get a pair of headphones for just \$119 (£90). The project is already well over its \$50,000 target, but there's no indication (yet) of any stretch goals. With a month still to go before the project's done, though, we're pretty sure they'll get some surprises knocked together as the weeks progress. Delivery of the goods is planned for October 2016, so get on board quick is our advice!

URL: kck.st/29vyjwM

Funding Ends: Tuesday, 2nd August 2016



Capture Case

The iPhone 6 and 6S both contain a passable camera, but they're not usually convenient enough to use instead of a point-and-shoot if you want to take decent pictures instead of just snaps – and the weedy flash doesn't help, given how poor the iPhone sensor is in low light. If you want to make your iPhone into a slightly better camera, the Capture Case is just the thing you need.

This custom-designed case incorporates a larger, Xenon flash, a shutter button so you don't have to grapple with the screen to take a picture, a front-facing microphone to make capturing audio easier and its own rechargeable battery so that you don't have to run down your phone's to use it. The chunkier case even makes it easier to hold. The flash is over 1,000 times more powerful than the iPhone's built-in LED flash, so the difference it makes to your photos is incredible.

Best of all, these cases are produced in the UK, so you won't get stung by the pound's drop like you might for projects pledged in dollars. Early bird tiers start at £85, but they're going fast – if you miss the cheapest you can still pick it up for £90, £95 or £100. Higher tiers include a free tripod, and every version nets a free upgrade to the iPhone 7 version if you buy a new phone before the device starts shipping in November 2016. Its £25,000 target hasn't yet been reached, but it seems likely it will be.

URL: kck.st/29HnneU

Funding Ends: Saturday, 30th July 2016



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

PDFtk Free

Manipulating files just got a little easier

A recent PDF task had me scratching my head: I was tasked with extracting the first page of 98 individual PDF documents and converting them into JPGs.

Naturally, I could have done it the old fashioned way of opening the PDF, saving the first page in a newly created sub-folder, closing the PDF down and opening the next one. But this is the 21st century and I'm using a PC, so there must be a way to automate such a process? As it happens, there is.

The PDF Toolkit

I eventually came across PDFtk Free, the free version of the impressive PDF Toolkit by PDF Labs. This rather wonderful program allows you to merge, split and extract one or more pages from multiple PDFs into a new single PDF document that can later be manipulated.

The process is reasonably easy. Start off by downloading the software from goo.gl/M5u1mF and installing it. Once installed, open it up and click on the 'Add PDF' button to find and load up the PDFs you want to extract pages from.

Depending on the amount of PDF and their size, the program won't take too long to get import the information. The main

window, once the PDF are read, will display the PDF name, its page count and the pages to copy.

The Pages to copy is where you'll fine-tune the extraction process. You can select individual pages, (in my case page 1), a mix of pages such as 1, 2, 3 and so on, a range of pages such as 1 to 5, 7 to 14, or you can also just opt for even or odd numbered pages after a range, such as 1 to 8even.

When you've made your selection and the pages required, click on the Create PDF button at the bottom of the screen and name the new PDF, which comprises of the selected extracted pages you chose from the previous step.

What's more, if you're looking to run this in the background, then the package comes with a command line tool, which will accomplish the same as the GUI version, but can be run as a batch file or a scheduled job overnight if you have lot of PDFs to get through.

Pro version

The free version was all I required at this stage, but for a mere \$3.99 (around £3.10) you can purchase the Pro version of the PDF Toolkit.

The Pro version allows you to split, merge, rotate, watermark, stamp and

Features At A Glance

- Free version available.
- Just £3 for the Pro version.
- Command-line tool for large-scale batch processing of PDFs.
- Multiple options available for extracting and manipulating PDFs.

secure with a password any of the pages you'll manipulate from a PDF. Incidentally, there's also a PDFtk Server edition, which is the original command line tool that's used on servers for huge batch processing of PDFs.

The Result

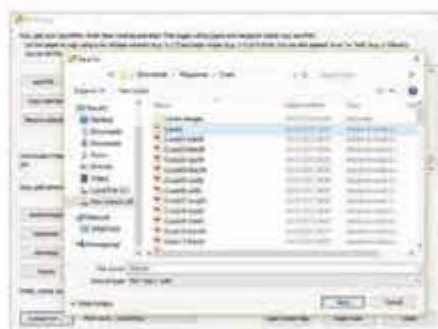
PDFtk Free really helped me out on this occasion. The final PDF created from all the page ones of the original 98 PDF were eventually dragged over to an online resource that pulled each page and converted them into individual JPGs. I now have all the *Crash* magazine covers as images.

Give it a try

PDFtk is one of those handy tools you happily have installed on your system for when something like this crops up. It's free, works well and comes with a command line tool. What more can you ask for? [mm](#)



▲ Load up the PDFs and choose which page(s) you want to extract or use



▲ Save the extracted pages as a new PDF



▲ The final version for my project, once I'd run the new PDF through a PDF-JPG converter

Logging Off

The extent to which my father, who died many years ago, coloured my life has only really become crystal clear to me recently. He was an engineer by trade and prided himself on being able to build or make anything in a pinch. Laying bricks, glazing windows, plumbing, electrics, he did it all. Or rather he tried. While confidence was never an issue, the end results of his efforts never really lived up to his boundless enthusiasm.

My childhood memories are peppered with epic moments when he ended up well outside the envelope of his skills, often with hilarious consequences. There are so many, but the one that I remember most vividly was when he built a sun lounge onto the house. He glazed it with an enormous single sheet of toughened glass he'd ordered from his then employer, Pilkington Brothers.

Having set this huge piece of glass into the putty he stood back to admire his handwork only to have a neighbour simultaneously knock on the back door, that my mother then opened. Air rushed right through the house, and applied a small but sufficient pressure to pop the glass cleanly out in a split second.

It shattered into a million pieces as my father and I looked on in utter horror. The mistake here was not closing the adjoining door to the house and trying to do it alone – but that wasn't the usual error he made. No, his usual trick was not to have the right tool for the job, and trying to fudge it using a totally inappropriate one instead. As a result, many of his jobs ended up with rough edges that belied the toothless saw, broken screwdriver or blunt chisel he'd abused.

Over the years his reluctance to be properly equipped has cost me plenty, because there isn't any task I won't do that doesn't involve buying a new tool. Therefore I've now a vast collection of specialist devices that I've only used a few times, though I'd contest that my DIY looks considerably better than his ever did.

It isn't only in my extensive collection of saws and drill bits where this can be seen, it's also in my computing. Using the same philosophy, I've searched out the right



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software tools for what I'm doing rather than trying to fudge a job with those that just aren't suitable. I've lost count of the number of times I've seen people struggling to make Word act like a desktop publishing system or Excel be a database so, if you're using software to do something and it feels like you're trying to juggle with sand, stop and think!

While you might know how to use a particular software tool well, it doesn't make it a Swiss Army knife for every problem – whatever skills you've got. You may not relish the idea of learning something new, but using the wrong tool and making really hard work out of a relatively simple exercise doesn't save time at all.

While I'd be the first to encourage people to push their boundaries, knowing your limitations is critical when confronted with jobs the end result of you'll be forced to live with. That's what I learned from my father, along with the universe's inherently natural tendency to perfect comic timing.

Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 7 Youngs Modulus, 8 Xerxes, 9 Sothic, 10 Ejector, 12 ASCII, 14 Pyros, 16 Jovians, 19 Giotto, 20 Latite, 22 Decontaminate.

Down: 1 Cone, 2 Anoxic, 3 ISA Slot, 4 Noise, 5 Quotas, 6 Audition, 11 Jay Miner, 13 Coulomb, 15 Outbox, 17 Intent, 18 Motto, 21 Tote.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. As the current political turmoil goes on around us it seems like a long time since London hosted the Olympics. Yet it was four years ago this week that Bradley Wiggins rang that big old bell and kicked off Danny Boyle's opening ceremony: a couple of highly entertaining hours that set the tone for the next couple of

weeks. It was pretty great, wasn't it? Even the cynics among us have to admit that it wasn't as terrible as it could have been, right? Well, we enjoyed it anyway. If a week is a long time in politics, though, four years is... what? A lifetime? Well, yes... apparently it is, because we've just found out Theresa May's going to be taking over from David Cameron as our Prime Minister, and that Mr Cameron is apparently contemplating life as a songwriter in his post-PM idyll (tinyurl.com/zxwnmlv). We can imagine Mrs May will feature heavily herein over the coming months, not least because – as the architect of the recent Investigatory Powers Bill, her opinions on online privacy now carry even more weight than they did before. Cripes.

THIS WEEK'S CROSSWORD

Across

7 He produced the first slimline electronic pocket calculator in 1972. (5,8)

8 A choice that is made by counting the number of people in favour of each alternative. (6)

9 Silver surfers? (6)

10 Handheld controller for computer games. (7)

12 A three-note major or minor chord; a note and its third and fifth tones. (5)

14 Feeling or showing pleasure or contentment. (5)

16 .bo TLD. (7)

19 In mathematics the set of values of the independent variable for which a function is defined. (6)

20 A person who buys and sells shares, securities, or other financial assets as a principal rather than as a broker or agent. (6)

22 A British unit of weight equal to 50 kg or 112 pounds. (13)

Down

1 A humble request for help from someone in authority. (4)

2 Develop over successive generations as a result of natural selection. (6)

3 There used to be one on every pub table until 1st July 2007. (7)

4 Investigate or look around furtively in an attempt to find out something, especially information about someone's private affairs. (5)

5 A control which is moved horizontally or vertically to control a variable. (6)

6 The literary intelligentsia. (8)

11 A circuit or device in which the value of a data item is represented by a continuously variable physical quantity rather than digitally. (8)

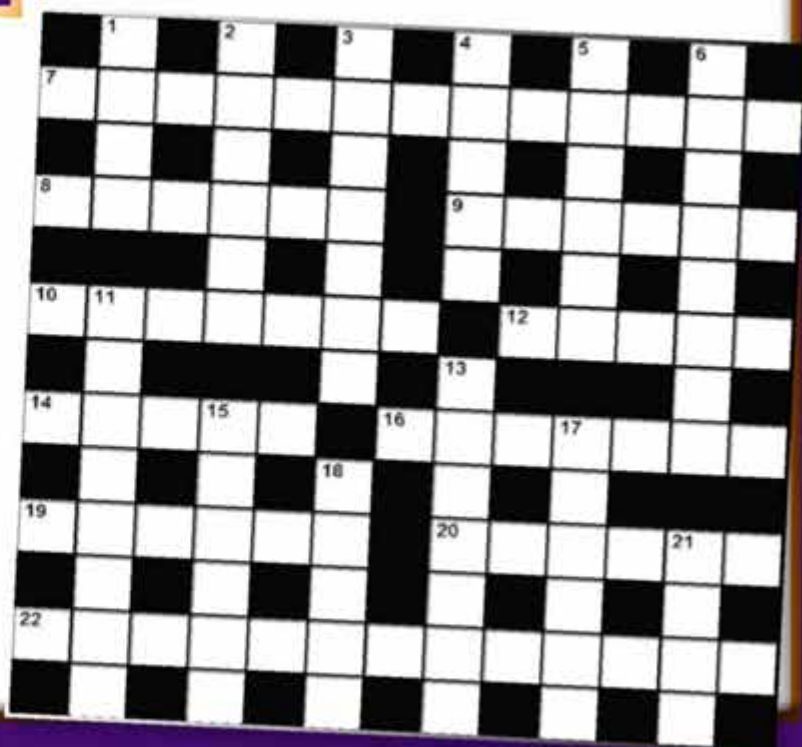
13 Slang term for inside information (7)

15 A Russian daily newspaper, founded in 1912 and from 1918 to 1991 the official organ of the Soviet Communist Party. (6)

17 A typeface with letters slanting upwards and to the right. (6)

18 An alphabetical listing of names and topics with references to where they are displayed. (5)

21 A reflected radio or radar beam. (4)



In Next Week's Micro Mart*

- Linux in space! How open-source software is going into orbit in 2016
- How to fix PCs remotely
- Freeing up space on your phone, quickly and easily
- Plus the usual mix of news, features, reviews and advice



* May be subject to change



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